The Tool Engineer

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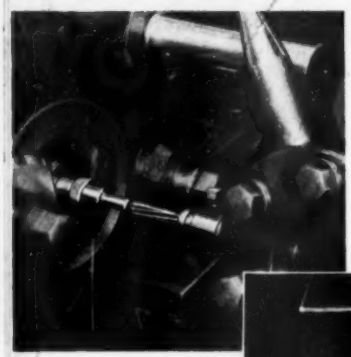
FEBRUARY, 1937

In This Issue

Official Publication of the
AMERICAN SOCIETY OF TOOL ENGINEERS

HEADQUARTERS!



SMALL TOOLS

Pratt & Whitney make almost every type of cutting tool. Space here will not permit a complete listing. On this page is a brief presentation of the newest P&W achievements in small tool manufacture.

Above: P&W Stub Screw Machine Reamers provide the decimal sizes so necessary in accurate production where close fitting is needed. They are economical tools capable of excellent performance and long life.

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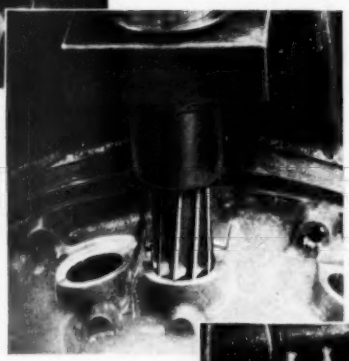

Left: Reaming valve rod holes in a duralumin casting using P&W "Blue-Helix" Reamers —available in decimal sizes.

• • •

Right: Profile milling in heat treated high alloy steel 315 Brinnell. P&W milling cutters include all kinds.

Above: P&W Die Sinking Cutters are designed for use at high spindle speeds, working in tough die steels. They have cutting characteristics that are amazing. Ask for literature.

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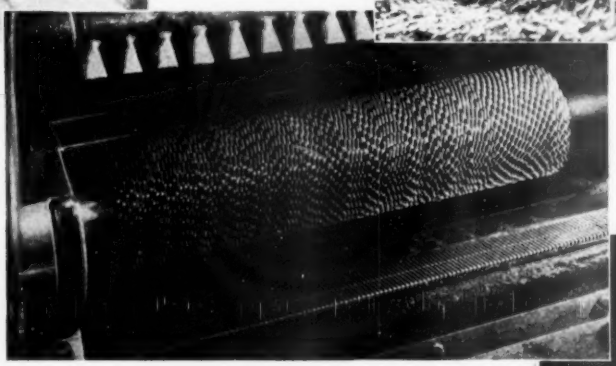
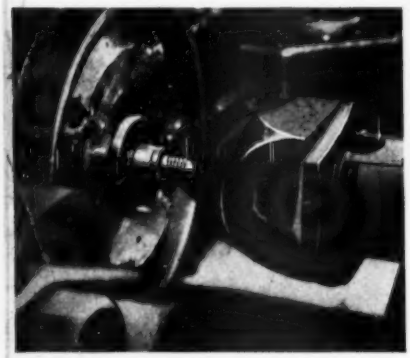
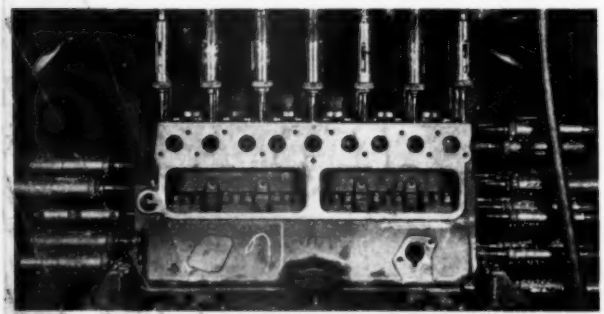
Below: The Duocone Die is so designed that fine accurate adjustment is possible, and at the same time is very simple to regrind. It produces smooth, accurate threads at fairly high speeds.



Below: The excellent records made by P&W Thread Rolling Dies are the result of careful design, material selection, and accurate heat treatment, characteristics of every P&W small tool. One pair of these dies produced over 14 million threads!



Above is an interesting application of P&W Saws, gang mounted to mill the slots in a typewriter spacing bar. P&W Saws and Slitters are available in all styles, and for doing all kinds of work. Ask for complete information.



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Left: A three-way Natco tapping machine using 43 P&W taps simultaneously. P&W taps include all kinds, from the smallest to the largest, and all sizes in between. Have you a copy of our Small Tool Catalog?

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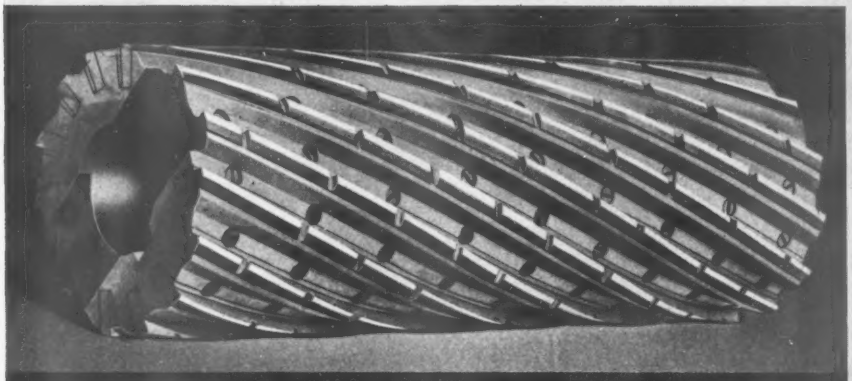
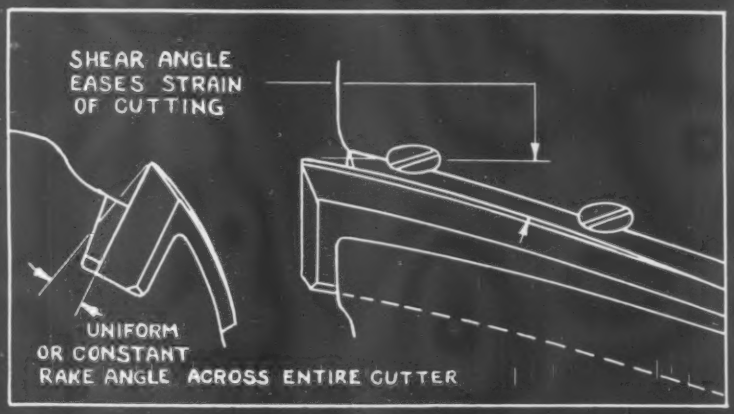
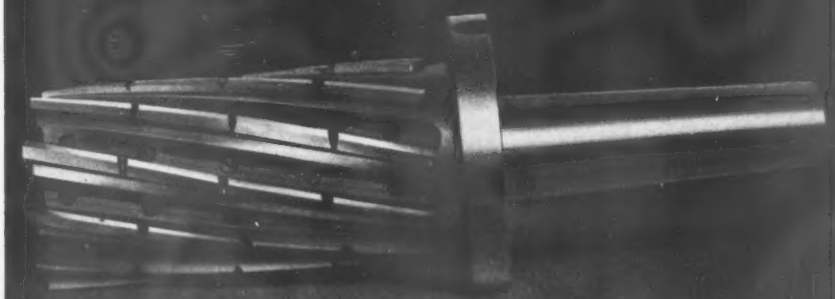


CHEAPER INITIAL COST



REPLACEMENT COST OF BLADES FRACTION OF INITIAL COST



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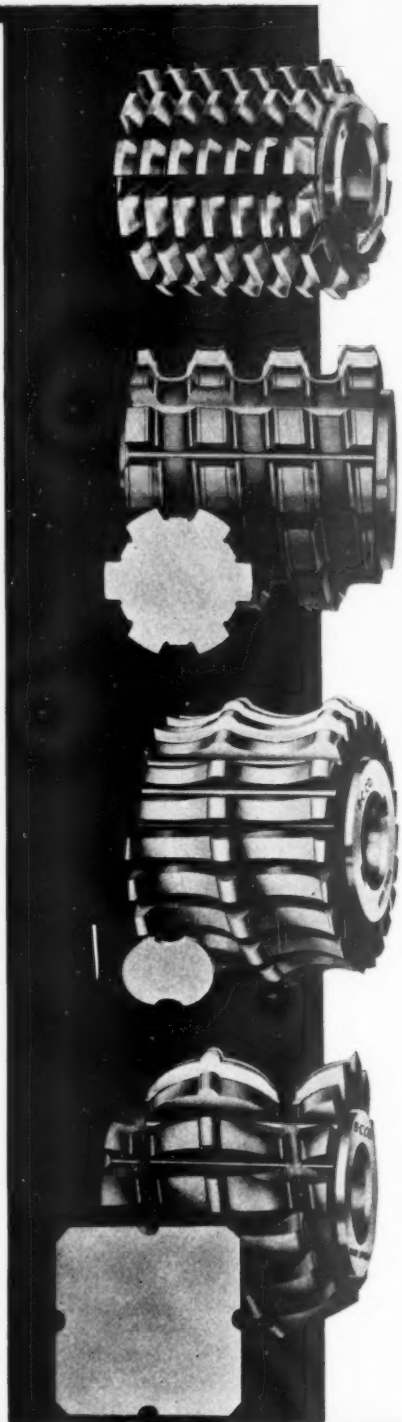

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Ground Hob for straight-sided heading die. Note curved surfaces on tooth form, all finished accurately by grinding.

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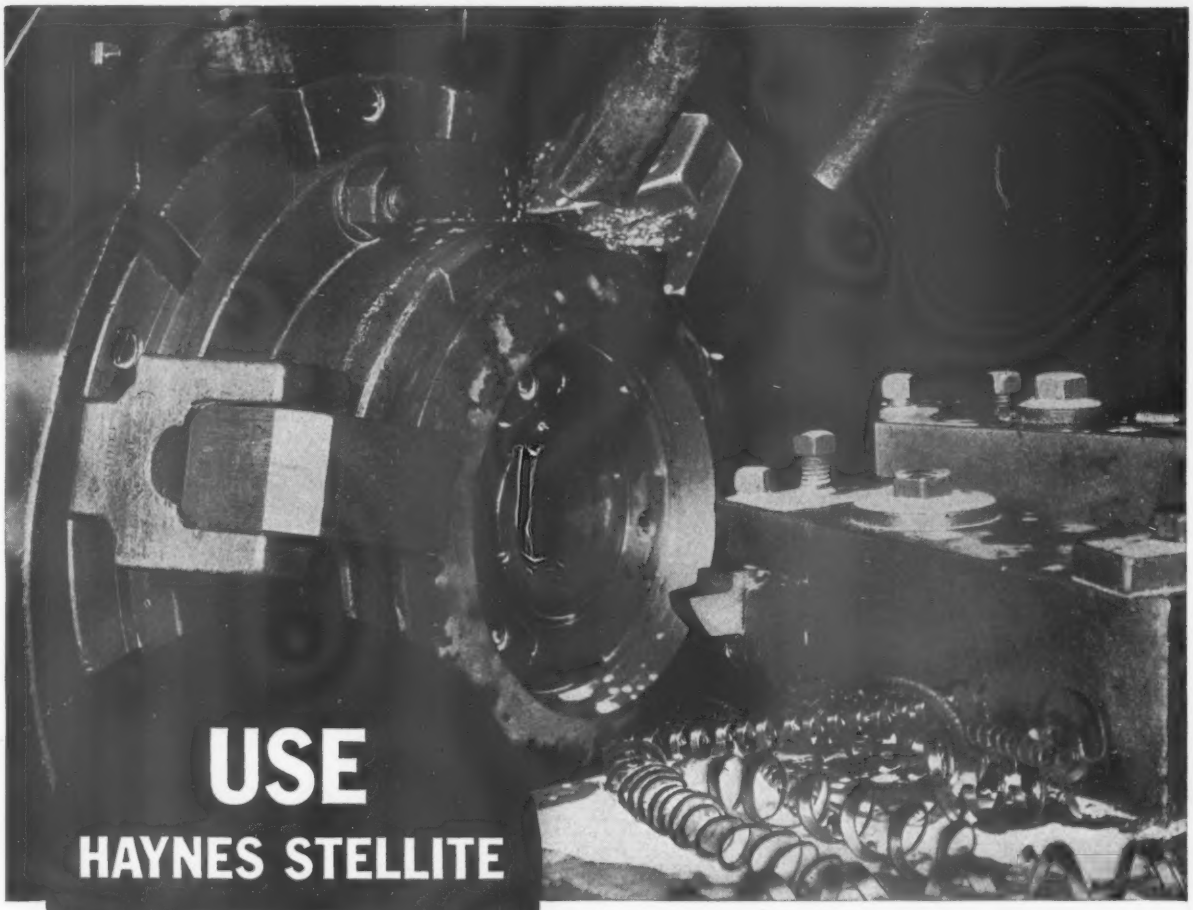

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Application blanks and information pertaining to membership in the American Society of Tool Engineers may be had by addressing **The Tool Engineer,** 2842 W. Grand Boulevard, Detroit, Michigan, or the Secretary's office, 5928 Second Blvd., Detroit, Michigan. **Dues** are $5 initiation fee, $6 per year for senior grade membership and $3 per year for junior grade membership. Junior membership initiation fee $2.

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Owing to the nature of the American Society of Tool Engineers organization, it cannot, nor can the publishers be responsible for statements appearing in this publication either as papers presented at its meetings or the discussion of such papers printed herein.

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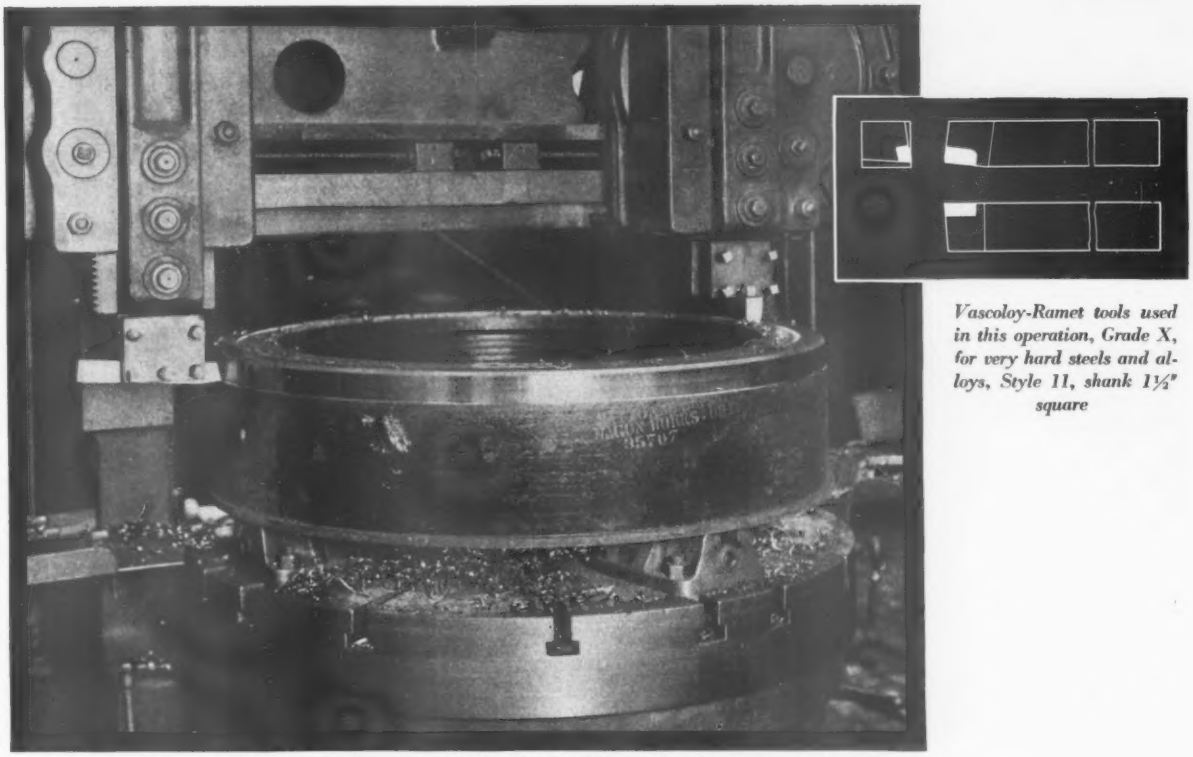

Vascoloy-Ramet tools used in this operation, Grade X, for very hard steels and alloys, Style 11, shank 1¼" square

Facing and turning 46-inch brake drum. Material : Steel forging S.A.E. 4650, heat treated to an average Brinnell hardness of 500. Operations : Rough turn outside diameter, face mounting flange, finish turn outside diameter. Comparative performance, Vascoloy-Ramet and Cobalt H.S.S. tools:

Tools used	Operation	Depth of Cut	Feed	Speed—Feet per minute
Vascoloy-Ramet Grade X	Rough Turn O. D.	⅛" to $\frac{3}{16}$"	.024"	150
	Facing	⅛"	.032"	150
	Finish Turn	$\frac{1}{16}$"	.024"	180
Cobalt H. S. S.	Same operations averaging 26 feet per minute, with frequent grinding			

Another performance record for Vascoloy-Ramet! Another record for increased production per grind, for greater speed from floor to floor, for lowered machining costs! Another reason for its rapid and widespread acceptance as the preferred tool material.

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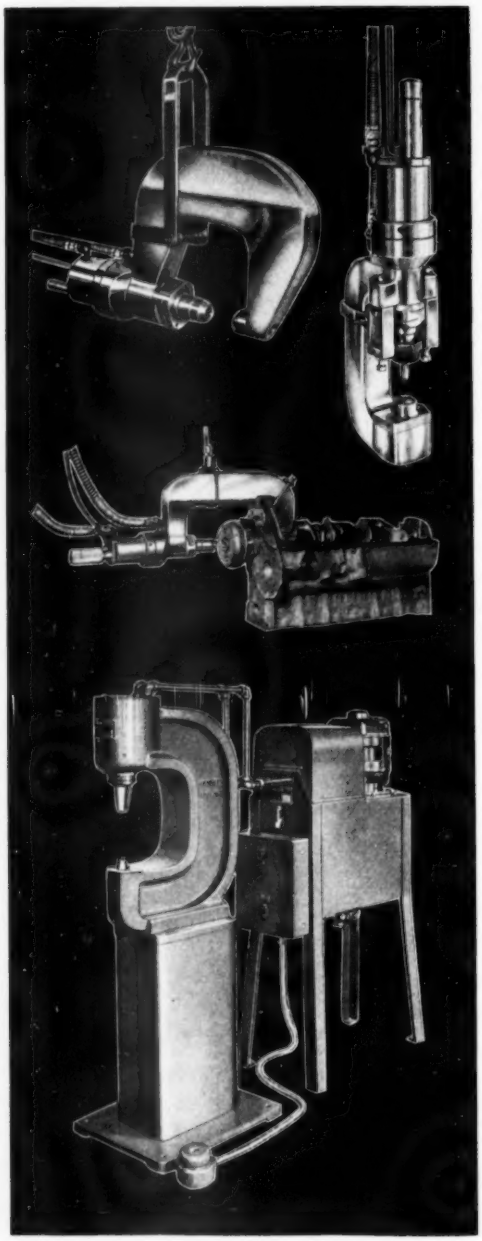

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[Presses illustrated — Top left: 50 ton Portable Yoke Riveter. Top right: 17½ ton Portable Punch. Center: 17½ ton Portable Press. Bottom: 17½ ton Stationary Assembly Press.]

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PRECISION BORING

R. M. LIPPARD
PAST PRESIDENT, A.S.T.E.
TECHNICAL EDITOR
for this issue

AN OLD METHOD WITH A NEW NAME

FOR MANY YEARS we have used the terms, turning, milling, boring and such common terms as apply to machining practice and it is very seldom that a new method which calls for a distinctively new name appears on the horizon.

In this issue we are covering in a general way a new method called "precision boring" which is actually the old well known method of "fly cutting" brought up to date and applied to production requirements.

To arrive at the point where fly cutting could be applied to production work required considerable research and development and the principal retarding factor seems to have been the lack of proper cutting materials to make the method practical.

Diamonds were used with marked success on certain classes of work; in fact the term "diamond boring" became a coined phrase as covering the method, but today the term "precision boring" has practically superseded this term due to the fact that Tungsten and Tantalum Carbide materials have in many cases displaced the diamond. Diamonds, however, are still used to a very large extent on non-ferrous metals with excellent success.

There is no doubt but what this new method of machining holds great promise to industry and in the short time it has been in use its value as a method for obtaining the highest degree of accuracy in production hole finishing has been proven. A few such applications are explained in this issue.

In writing on this subject we do not have the volumes which are available on the older subjects as the method is comparatively new and the technique has only recently been developed. We have been extremely fortunate in having articles contributed by men who have been pioneers in the field and who have seen the great possibilities of the practical application of the method.

The Carboloy Company has played an important part in developing the Tungsten and Tantalum tools which have played such an important part in the development of the method and the article by Mr. Lothar Breuer will be found extremely interesting.

The application of diamonds to precision boring is very well covered by Mr. Charles Koebel of the Koebel Diamond Tool Company in his article on "Diamond Boring Tools."

We are also greatly indebted to Mr. Ira J. Snader of the Ex-Cell-O Aircraft & Tool Corporation and to Mr. Berkeley Williams of The Heald Machine Company for their contributions.

We feel that the pioneering work which these companies have done has gone a long way toward putting this new method on the high plane that it is today.

MEETING PRESENT AND FUTURE PRECISION BORING DEMANDS

By

Ira J. Snader

Research Engineer Machine Division
Ex-Cell-O Aircraft & Tool Corp.

Precision is rapidly becoming an important factor in the manufacture and performance of the majority of present day products. Greater emphasis is being placed on quality and long life due to the influence they exert on our every day life. Our transportation by highway, rail and air, our conveniences in the home, our standards of living, our health, and many other factors too numerous to mention, are dependent either directly or indirectly on precision.

Through constant development and research work, equipment has been produced so that it is now possible for every manufacturer, large or small, requiring a high degree of accuracy on his products, to precision bore, turn, face, groove and perform similar operations without being penalized by unreasonable costs. It is possible to combine several different operations on a single part or different operations on a wide range of parts on one machine and maintain the same uniform accuracy. There have been a vast number of precision boring machines installed during the past several years in the automotive, refrigerator, electrical motor, farm machinery, road building, aircraft, railroads, parts manufacturing and other metal working industries which indicates the wide scope of these machines.

Typical installations have been selected to illustrate the flexibility of these machines. Figure 1 is a senior double end precision boring machine tooled for finishing aluminum pistons for a Diesel tractor engine. It handles five operations—turning five ring grooves, facing the dome, facing the spherical radius on the dome, turning the O. D. of the piston skirt, and boring the wrist pin holes—in one operating cycle. Four boring units with individual motor drives, are used on this job. The production at eighty-five per cent efficiency, including all operations, is twenty-seven pistons per hour.

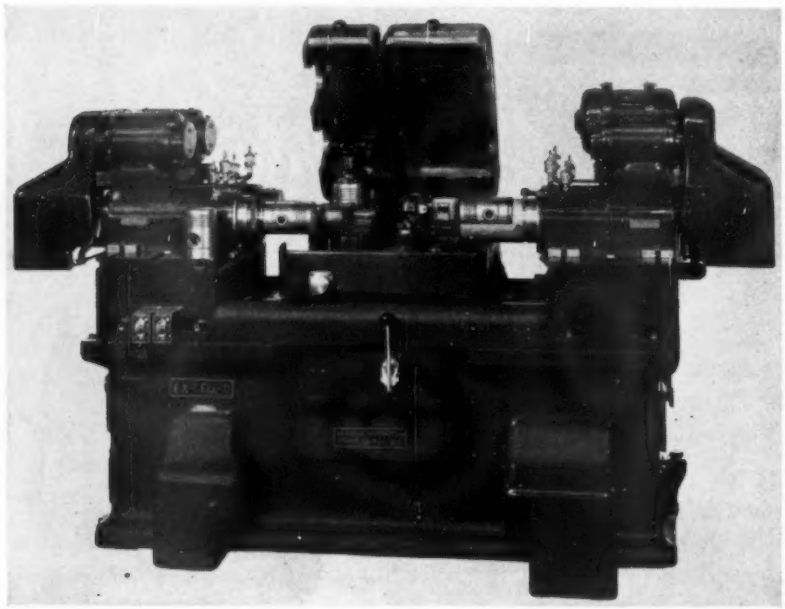


Fig. 1. A senior double end precision boring machine for turning five ring grooves, facing dome of piston, facing spherical radius in dome, finish bore wrist pin holes and turn O. D. of piston in one operating cycle.

A close-up view of the fixture is shown in Figure 2. The station at the right and at the back turns the five ring grooves with Tungsten Carbide tipped tools and turns the face of the dome with a diamond tool. The station at the right and in front, faces the spherical seat in the face of the piston dome simultaneously with the operations just described. A diamond tool is used on this operation as well as on the operations performed on the opposite end of the machine. These pistons are mounted on the nose of the boring units and held in place by a draw bar operated by a foot valve. After the table moves to this end of the machine it comes to rest at a predetermined position and a hydraulic cylinder advances a tool block with the facing and grooving tools. The spherical radius facing tool at the front station, is hydraulically operated by a separate cylinder and has a rotary motion. These tools are so timed that their respective operations are completed and withdrawn from the work before the table can return to the center of the machine. The work table then moves to the opposite end of the machine where two pistons have been loaded, while the operations at the right end were being performed.

At the back station the piston is placed in a vertical position and correctly aligned by a pin inserted in the wrist pin holes and manually operated aligning fingers located on the fixture table. The piston is then clamped by an equalizing plate on the dome end. The aligning fingers are released and the pin removed from the bore, the piston is then ready for finish boring. This is the only station where the boring tool is supported and driven by the boring unit.

The piston at the front station is also mounted on the nose of the boring unit as previously described and the tool block supporting the tool for turning the skirt is hydrauli-

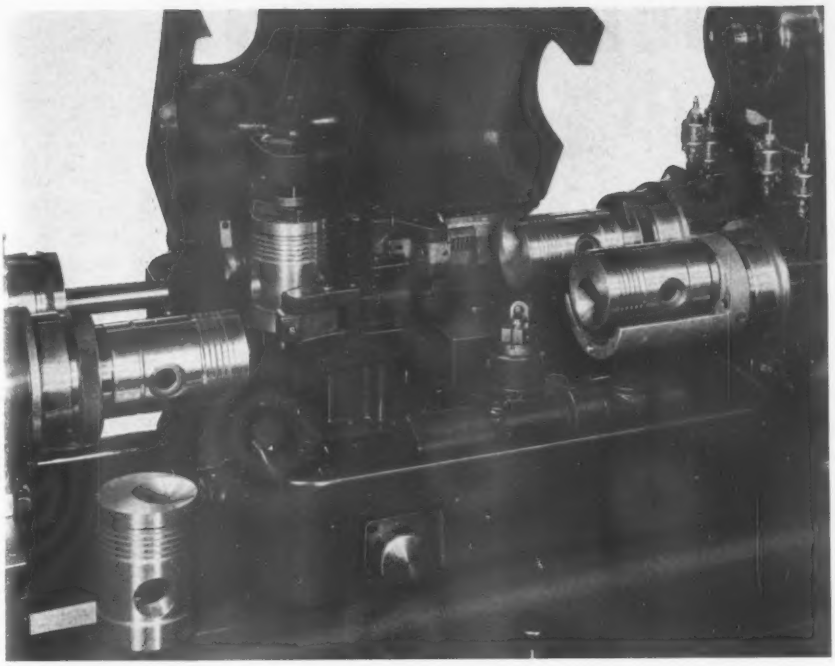


Fig. 2. A close-up view of the four station fixture for performing five different operations on a Diesel piston. Complete machine illustrated in Fig. 1.

cally operated. The boring unit is placed at the desired angle so that the proper taper is turned on the O.D. of the piston. These two stations are hydraulically interlocked so that the fixture table can only return to the starting position after both operations are finished. New parts are loaded on the opposite end of the machine while it is completing this part of the work cycle.

The installation just described illustrates multi-operation, low production on the same part while Figure 3 represents a high production, single operation performed on a junior double end precision boring machine. This machine is tooled for finish boring the bronze bushings in three connecting rods at each end of the machine. The production at eighty-five per cent efficiency is three hundred and thirty rods per hour.

Three inbuilt balanced motor driven boring spindles are located at each end of the machine for boring the connecting rods at that end of the machine. The connecting rods are inserted in a vertical position with the large end at the top locating on a plug and clamped against the face with three fingers. The small end is located with a flattened plug and clamped on the sides by two plungers. The fixture is hydraulically operated.

After the three parts are loaded on one side of the fixture, the table advances to that end of the machine where the three rods are finish bored while the operator is reloading the opposite end of the fixture. When the cut is completed in each connecting rod, the boring units are stopped by means of hydraulic brakes, so that the cutting tools are in a stationary position when withdrawn from the finished bore. The table then advances to the opposite end of the machine where the same operation is repeated.

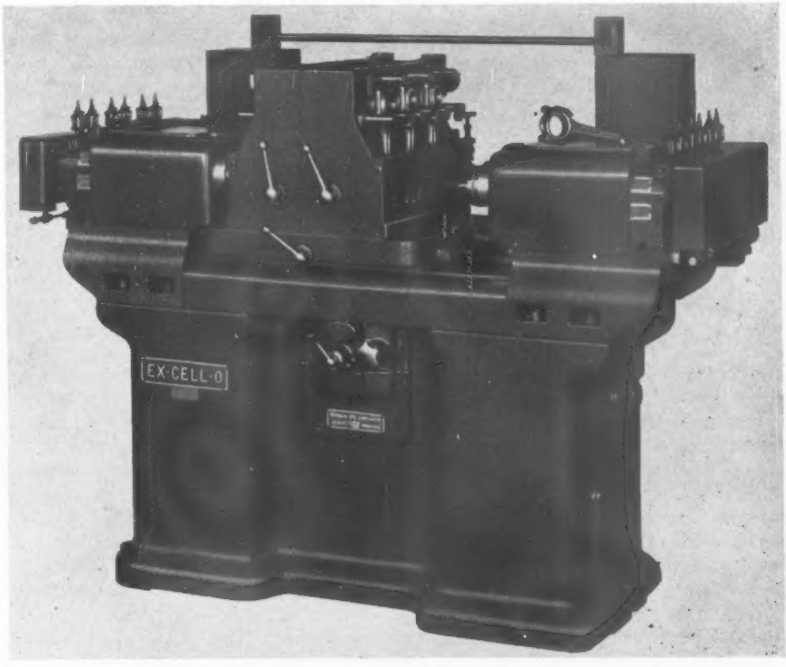
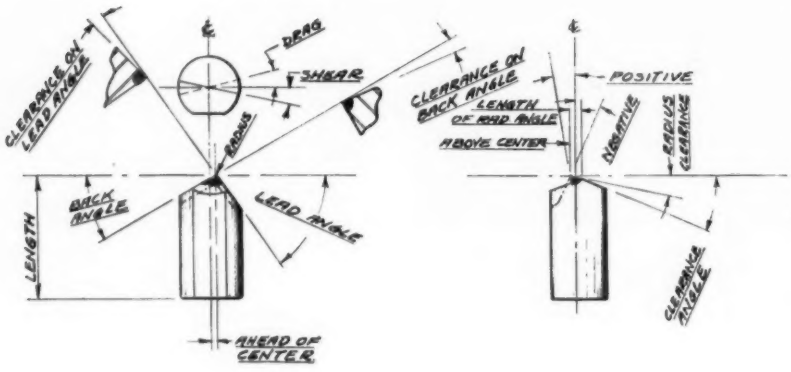


Fig. 3. A Junior double end precision boring machine for finish boring the bronze bushings in automobile connecting rods.

DIAMOND BORING TOOLS

By
Charles Koebel
Koebel Diamond Tool Company

Correct Cutting Angles and Clearances Are Important Factors for Satisfactory Diamond Tool Performance



If we were asked the question "just what is diamond boring?" our answer would be that it is simply an elaboration of the old principle of fly-cutting to obtain a truly round hole, BUT—and the exceptions implied by this "BUT" must not be neglected if the user is to derive the full benefit he has a right to expect from this type of operation. It is not our purpose here to go into all the ramifications of diamond boring machines; however, certain basic principles must be observed for the successful use of diamond boring (or turning) tools.

It must be emphasized that a diamond tool cannot be employed inter-changeably with a steel tool on any ordinary lathe or drill press. The diamond is the hardest substance known to man in terms of resistance to abrasion. This very quality, however, makes it proportionately brittle in resistance to shock. Therefore, when setting up for diamond cutting operations the first prerequisite is a spindle with absolutely no play or shake, and one that will stay that way. High speed and fine feed are also essential. The diamond tool must be held rigidly in its bar, and the work secured firmly and without distortion in the chuck. Depth of cut must be held to a minimum, and alignment and reversals of motion carefully controlled. These requirements have led to the development of several makes of specialized machines for the purpose of finishing production parts with the diamond. If these requirements are properly met there is no metal yet developed which can equal the diamond for the attainment of roundness, size, finish and economy in the production of non-ferrous parts.

Materials Suited to Diamond Cutting

That brings up the question of what materials are best suited to machining with diamond cutting tools. Non-ferrous materials contain a large amount of abrasive, and here is where the diamond tool proves its economy. Brass, bronze, aluminum, babbit, zinc alloys, bakelite, fibre, rubber, celluloid and rawhide are ideal examples. Generally speaking ferrous metals such as iron and steel are the only materials excluded from the list, although there are firms using diamond boring tools to enlarge the holes in their tungsten carbide dies. This, however, is the exceptional case.

The quality of diamonds used for boring and turning tools is much higher than for other industrial diamond purposes. Proper consideration must be given to cleavage planes, internal flaws and carbon spots. Approximately forty per cent of the weight of the original diamond is removed in shaping it to become a cutting tool. A very high class of skilled labor is used on this work, and years of experience being necessary before a diamond cutter can become really proficient. Clearance, rake, hook and shear angles must be given separate study on each individual job. (As shown in illustration).

Pointers on the Use of Diamond Tools

Often the question is asked "how long will a diamond tool last?" It is almost as easy to answer the question "how long is a piece of string?" So many variables enter into each job—machine, man, material, design of tool, etc., that there are no "usual" life figures available.

One of the greatest hazards to the keen edge of the tool is "free carbon" spots in the metal being worked and metallurgists are always striving to eliminate these defects. There are ways to prolong the life of the tools, however, and the operator who keeps his eyes open is not long in finding them. Starting and stopping the tool "in the cut" is always dangerous. Set-screws must be kept tight and the job must be kept free of surplus chips. Be sure that the first operations bring the job to the diamond boring with a uniform amount of stock to be removed. Be sure to inspect the tools upon receipt to insure uniformity of results. Use set-up gages and do not depend upon cut-and-try methods—most "accidents" occur in set-up. Keep the cutting edges keen—if allowed to become dulled the resulting increase in pressure is likely to cause fracture, thereby reducing the available number of relaps from a given size diamond.

By observing a few simple rules of this kind, diamond tools will be found to give many times the productive life of steel or alloy tools, and will contribute to very economical operation.

PRECISION BORING TOOLS

By
Lothar Breuer
Service Engineer, Carboloy Company

The development of precision boring, turning and facing operations has been very rapid during the past four or five years and the machine tool builders have worked hand in hand with Tool Engineers in solving the many problems which have arisen. New and improved grades of carbide have played a part in this program but the development of correct tool shapes, design and methods of application to conform with the physical properties of the carbide used has been a more important factor in the success obtained. Through these factors Carboloy has been a means of reducing costs, improving the quality of finish and maintaining greater accuracy.

The solution of the problems connected with the application of precision boring tools is usually simple, but requires close attention to fundamentals. Within the past few weeks we have carried out such work on two applications of boring and we believe that a complete description of one of these jobs will illustrate these fundamentals.

The Job

The job was to bore to dimensions holes 2.750" diameter x 7" long within a total tolerance of .0003" for size, roundness and straightness. Further, only .0003" to .0006" on the diameter was left for honing, requiring a very high quality of finish. The material was cast iron with an average hardness of 240 Brinell and the following chemical analysis: Si., 2.20—2.40; Mn., .60—.70; Ph., .20 Max.; S., .10 Max.; C., 3.10—3.30; Ni., .35—.45; Cu., .45—.65.

The work was done on a standard precision (sometimes called diamond) boring machine which had been in use fifteen months. The spindle had been overhauled recently. The feed was .007", depth of cut .007", and cutting speed was 324 feet per minute.

The Problem

The problem given was to reduce the tool cost per hole. The tool which had been used is indicated by Figure 1, below.

Production per tool was not satisfactory and was about 150-250 holes per grind. The grinding was being done free hand on a 240 grit diamond wheel. Observation showed us that some of the tools had a decided tendency to chatter and failed by chipping at the cutting edge.

The Solution

Having observed some chatter and chipping of the cutting edge with tools of the design in use (See Figure 1) we changed the shape of the tools to that shown in Figure 2.

You will notice that the radius at the point has been reduced from 1/16" to 1/32" and that clearance has been ground on the tool at the leaving side of the point. The smaller radius at the point cut down the friction which is the basic cause of vibration or chatter. At the same time the decrease in the point radius increased the load per unit of area at the active cutting edge. This increase in load plus the fact that the previous tools had failed through chipping indicated that strength of carbide was of utmost importance.

Four tools of each of three grades of tungsten carbide were made up and ground by the same men to the shape shown in Figure 2. These were Carboloy Grades 883, 905 and 999. Grade 883 is the toughest and softest and Grade 999 is the hardest and most brittle. Grade 905 lies about midway between these two grades. We started with the toughest and softest grade. Eight runs with Grade 883 averaged 1068 holes per grind.

This proved that our changes in design had solved the problem of performance and left us to determine the best grade of carbide to use for tool life in holes per grind. Runs made with Grades 905 and 999 would answer this question as both grades are harder and weaker than Grade 883. We averaged 927 holes per grind with Grade 905 and 733 holes per grind with Grade 999. Grade 999 showed a tendency to chip, proving improper matching of physical properties of the work and carbide.

There were no tool adjustments made during any run. The tools were removed from the spindle when the machined surface took on a "scratchy" appearance. This "scratchy" appearance was the result of the cutting edge being corrugated by the feed marks in the bore from the previous cut.

Conclusions

1—The harder the material being cut at any set feed, depth of cut and speed, the greater the load on the cutting edge and the necessity for using a strong grade of carbide.

2—Chatter is controlled by the radius on the tool point provided machine conditions are correct and the part being machined is heavy.

3—Use the largest possible radius at the cutting point consistent with the elimination of chatter to reduce the load per unit of area on the tool. This is of fundamental importance to tool life between grinds.

4—Accurately grind tools to a template, using a radius fixture and fine grain diamond wheel or dia-

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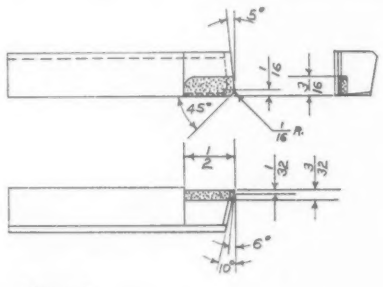


Figure 1.

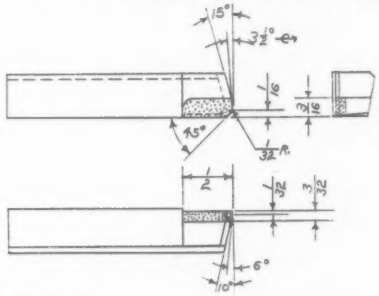
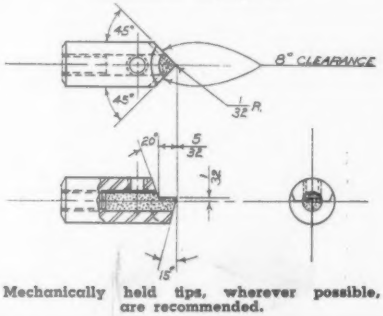


Figure 2.



Mechanically held tips, wherever possible, are recommended.

Development and Application of Precision Boring

By Berkeley Williams
Boring Machine Division
HEALD MACHINE COMPANY

Precision boring or diamond boring, as it is sometimes called, is a rather recent development. Although several applications of this method were made on production work as early as 1920, it was not until 1929 that satisfactory equipment was first introduced. Rapid strides have been made with this method of boring by employing the well-known tool room practice of using a single point cutting tool for generating a straight round hole and using either a diamond or a cemented-carbide tool for high cutting speeds.

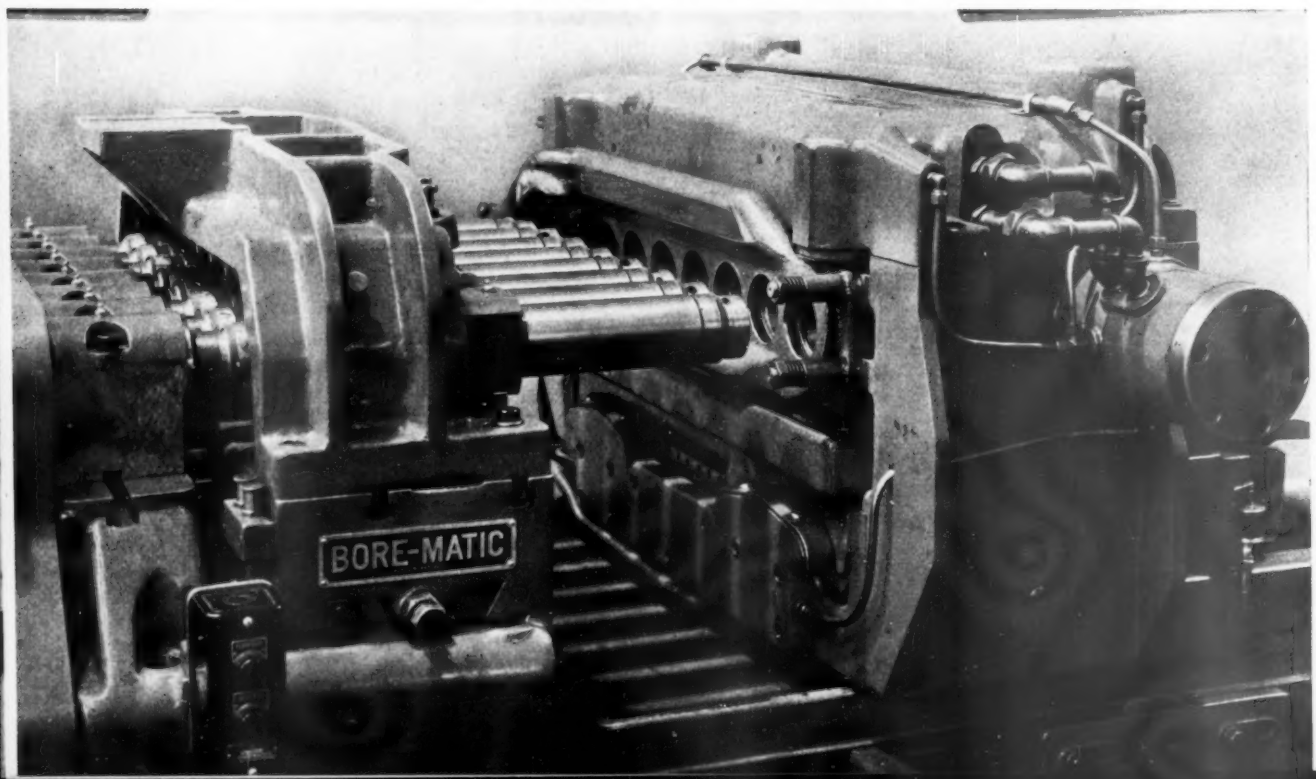
In developing the precision boring machine it was necessary to take several important factors into consideration. Vibration of the machine itself or in the spindle is objectionable, not only on account of the chatter which is reproduced in the hole but also on account of the widening use of the cemented carbide tools which are susceptible to shock. It is therefore necessary to eliminate vibration in order to obtain satisfactory tool life and proper finish. Boring spindles running up to 5000 RPM require a mounting which cannot have a runout of more than .0001" and a drive which does not introduce vibration. The relation of the table travel to the axis of the boring spindle must be accurately maintained and the moving member must have a smooth drive. Precision boring machines are today available which are so designed that vibration is eliminated by every possible means that can be used.

With tool material which allows a cutting speed of approximately 450 FPM on cast iron and up to 1500 FPM on non-ferrous metals and alloys it is possible now with feeds of from .002" per revolution up to .007" per revolution to improve the finish obtained by either reaming or broaching with no increased labor cost. In addition this method will finish holes in relation to other holes or surfaces within limits not obtainable by other methods, and the accuracy of the hole itself as regards its roundness and straightness is unprecedented in production machining methods.

It is now the generally accepted practice in the automotive industry to finish such important holes as piston pin holes in pistons, bronze bushings in gears, both ends of connecting rods, and such classes of work on precision boring machines. The most recent development has been the boring of the cylinder blocks themselves. Several years ago automobile engine cylinders were ground to obtain the necessary roundness and straightness. This operation was slow, in fact, it was so slow that reaming was substituted, after which the bores were honed to the desired size. It is often said that the principle of grinding the cylinder blocks was the most ideal method of machining the blocks from the point of view of accuracy because the hole was definitely generated in relationship to a given surface but the cost of grinding was such that the present method of reaming and honing displaced it. With the development of the precision boring machine it is now possible to generate the holes in a definite relationship with some given surface and with each other. By arranging these machines with multiple spindles all of the holes can be bored simultaneously. Figure 1 shows a machine arranged to bore all eight holes in a straight eight block in one setting.

Transfer of the block from the conveyor to this machine is simple and

Figure 1. All eight cylinders are precision bored at one setting



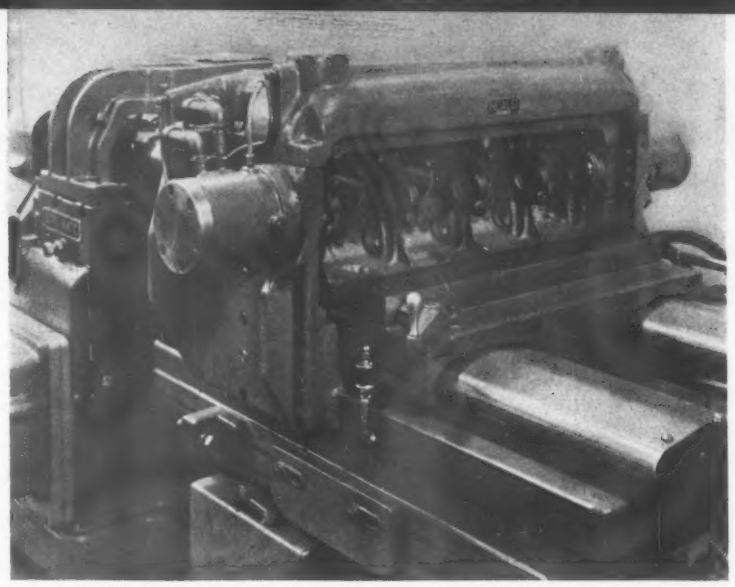


Figure 2. Table in position for boring block, centering plugs locating and locking block in place

fast because the block can be slid directly onto a horizontal conveyor level fixture without interference from the fixture clamping members. The fixture provides a hydraulic auxiliary slide on the machine table which receives the block from the conveyor in the extreme withdrawn position and locates it, approximately. A hand operated valve causes the auxiliary slide to move underneath a bridge solidly attached to the fixture base. Operation of another valve causes two opposed hydraulic plungers on the fixture bridge to enter the crankshaft holes of the block and lock it securely in place. The table reverse lever is then thrown over, the table travels forward and the eight cylinders are bored simultaneously. Figure 2 shows the block in position in the fixture.

In manufacturing household refrigerators where extremely close limits must be maintained, not only on account of the performance of the unit but also on account of the safety factor, precision boring was adopted practically from the start as being more accurate and more economical than any other method. The comparative ease and simplicity of maintaining size, straightness and alignment of holes, is resulting in the rapid improvement of this method in all industries where quality of products is an important factor.

In addition to finishing open holes this method is particularly adaptable to finishing blind holes. Because of the type of tool used a blind hole can be finished to within a few thousandths of the bottom without any necessity for an undercut or relief, and frequently at the same time portions of the bottom of the hole or surfaces at the outside of the hole can be finished at right angles to the hole without changing the tool setting. This is of particular importance in the preparation of holes for anti-friction bearings, valve seats and similar work.

The application of precision boring has now been applied to turning, facing, milling and slotting operations and one example of this method of finish slotting is shown in Figure 3. On this machine the vane slot in a refrigerator compressor cylinder is being machined to finish size. The cylinder is made of steel with a $\frac{7}{16}$" wide slot in the side, which is held to a tolerance of .0002". Two cylinders are slotted simultaneously using two boring heads mounted on the bridge of the machine. Each boring head carries two single point Tungsten Carbide tools for milling both sides of the slot at one time. The tools are mounted one at each side of the adapters attached to the boring head quills.

The cylinders are held in a two station fixture mounted on the machine table. At each station the cylinders are located from the bore by a centering plug and from the bottom face by five buttons. The slots are located in relation to the milling slots by pivoted fingers operated hydraulically, which automatically swing into place for loading and also swing back out of the way of the tools before the milling operation begins. Hand clamping is used to lock the work in place.

This is but one of many different applications that are being made of this method of precision or single tool machining. Combinations of boring, facing, turning and grooving are now being performed, which not only decrease the cost of the product but insure greater accuracy of product.

The hydraulic feed which has been so successfully applied to grinding machines, particularly the internal grinding machine, already developed to give a smooth feed with flexibility of change of table feed, was simplified for adaptation to the precision boring machine.

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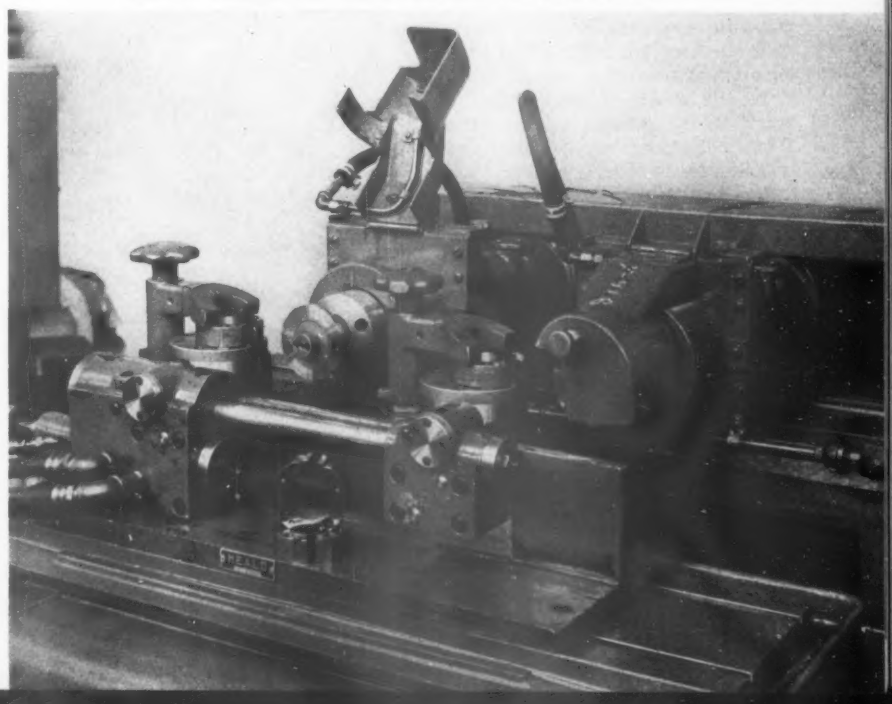
Figure 3. Finishing vane slot in refrigerator compressor cylinder



THE TOOL AND SOCIETY

By

W. J. Cameron

Ford Motor Company

As given before the Detroit Chapter of A.S.T.E. Jan. 14, 1937

You might say that for two thousand years men's admiration was challenged by the work of their hands. By the viaducts they built in ancient times, by the Chinese walls they constructed, by the great temples they reared and the roads that they flung across Asia and Europe and through the British Isles, by the cathedrals they built in a later day. But all these were achieved by the common tools known to man for ages. The pick and shovel, the hammer and the trowel, the chisel and compass and square, all of them representing fixed functions of the hand, fixed postures or fixed actions which needed not to be repeated by the individual in his work but could be picked out at leisure as he needed. The elementary reliable tools which saved men's fists and their skins and the nails of their hands. These simple things for ages served all the needs of the world in art, manufacture, agriculture and commerce and war and fishing and hunting—every occupation of man. The tool itself was a plain thing and attracted no attention. And now it is the tools that men use which vie with the work he does for our common admiration. Not what he creates, but the processes and the power of his creative act.

Take the automobile for instance. It is a marvelous creation. It embodies, all the arts and sciences amongst us today. It is vastly intricate in its design. It is made better than any watch in the world is made. A watch built to the scale of an automobile by watch making methods would drive us out of our cities with the noise which it made. The automobile has become a community in itself. A system of electric currents and lighting and water power, almost a miniature city in the various services which it brings to the process of transportation. And it is no wonder that after thirty years of life, thirty-years of use, the automobile still holds the romance and is still one of the youngest industries in the United States.

The romance, of course, comes from its use in the city and the country. It has taught women and youth to master machinery, it has changed the tempo of our existence, and extended the range and interest of mankind and mixed humanity in a manner that has never occurred before in any human community.

And yet, wonderful as the automobile is as a machine, it does not compare with the machine that produces it. That is what we are becoming conscious of today. The wonder of the machine that produces the machine. You go down to any great automobile factory and view it as a unit as one machine geared to turn out a certain product, and it is immeasurably more mysterious and wonderful than what it produces.

If that is striking in the case of an automobile, what must it be in the simpler things like the soda cracker. Think of the inventiveness, the ingenuity of the new uses of power and skill required to produce a soda cracker in our day, or pins or needles, or light bulbs or your cigarettes or the fruits which come to your door, or books and papers printed for your reading.

Mr. Ford once said that history is bunk, and he was very much criticized at the time of his statement. Now I think all the professors of history agree with him. He explained why he said it. He said he used to search the books of history to find the tools that men used; he asked, how did they plow, how did they bake, how did they cut their wheat, how did they make their wagon wheels? He read that this king lived and died, that army battled and died, this statesman arose and died, but the real forces beneath the surface society which were moving history forward and which were holding up the platform of the whole drama upon which these figures acted,—he couldn't find anything about that at all. That is how he came to write history in his museum. He began to gather together the tools that men have used from earliest times to keep this world going. To write history in the terms of tools. That was very easy to do if you start at the point previous to fifty years ago. But to write history in terms of tools since that time is becoming increasingly impossible. It would be an endless task, but at the same time nothing so much explains the movement in the world today, the very tempo of the human mind, the enlargement of human life. It is basic in the story of any interpretation of human life.

As man rises you can measure his rise by the tools he uses. As man rises his tools become more numerous, more diverse, and more complex. At first only a few men used tools. They were the aristocrats of skill. Inventiveness was born within them and they learned how to extend their minds and bodily powers by the inventions of tools, but only they could use the tools. But, as one man made a tool and demonstrated its use to his fellows, more and more men became supplied with the same simple instruments and we see in that gradual supply one tremendous step of human progress made. That is always the way human progress is made. One man takes the step, has all the benefit to himself for a while, and presently it flows out to the rest. We hear in our social discussions of today a great many mentions made of "privilege." We talk about the privileged classes, and the mobs sometimes march the streets of Europe saying, "Down with privilege." All the rights we have and all the conveniences we have and all the dignified refinements of human life we have began as someone's privilege—the privilege of a privileged class. But the history of privilege in this world is that when the advanced guard of humanity invents a privilege for itself and uses that privilege, tomorrow it becomes the common right of the human crowd around them. So it was with tools.

At first only a few men used the tool. Then came a great step when most men who had to work could find a tool to use. Then it was that the tools became more diverse. More things were done with tools. There came refinements of use, there came a division of labor in the various separate tools themselves as experience went on. If you turn to your own kitchen you will see how diversified has become the use of tools in the common details of human life. The spoon and the knife and the fork. Three diversities of one use, formerly served without any tool at all.

Then came not only more tools and a more diverse use of tools but greater complexity in the tool. We

are becoming conscious of that complexity today and we measure our progress in terms of the complexities of these things. The genius of highly skilled artisans requires more and finer tools. But here is the point that seems to me to clothe the whole philosophy of progress, that as the man who does things freezes and fixes some of his genius into a certain shape of tool or into a certain kind of tool, he thereby makes it possible to transfer part of his genius by means of the tool to all who use it after him. Much of the skill that men possess today has been transmitted that way, in the fixed things that someone first developed for his own use and passed on to his sons or those who followed. Formerly men had only the sail to catch the wind. A blade for scraping skin. The same blade, a little larger, for cutting the soil. An instrument of force like the fist hitting or the arm throwing. An axle on two wheels. The axle was as great a discovery as the wheel itself. But with his rise into the realms of intelligence man has multiplied that limited world ten thousand fold. Whereas he could do one thing at a time in former years, he now does twenty and forty things at a time. He has machines that can listen for him and hear for him and report sounds for him. He has machines that can see for him. He has machines that can count for him. He has machines that can judge and choose or reject for him. He has machines that bring a summer climate in the depth of winter or bring the coolness of autumn in the heat of summer into his homes and buildings. All these are the product of multitudes of minds concentrated upon this new, great, modern development, the tool. Commonplace ideas grabbed out of the atmosphere of the mind by countless engineers.

We walk in the midst of more ideas today even in our country towns than ever swarmed the earth before. There is a great gateway to the world of truth and beauty, through this field which so many of you have made your own. It is a basic world. It is a world in which you can't lie. It is a world you can't cheat in. It is a sound world. It goes down into beauty and into morality.

It seems almost sacrilegious to some to speak of beauty in connection with machines. Beautiful machines! But there is one mystery of the machine tool that always fascinates me, and that is its constant tendency toward beauty as it tends more and more toward efficiency. The more a machine fills its purposed use the more beautiful and symmetrical its design becomes. When you see an ugly machine you can almost put it down as a certainty that it is an unperfect machine. That it is overweight. That it is over-noisy. That it is awkward. That it is not doing its job in the best way. And as it becomes perfected and does its work in a better manner it begins to take on lines of character as a man devoted to his work and mastering it begins to take on lines of character in his face. And you begin to have a respect for the machine. It stands for an idea.

Tooling Up for Society

Now I think that all of us are conscious today that when we work with tools, we are creating more with them than merely the commodities we make with them. We are creating more with the tools we invent than anything we turn out with them. We think we are making automobiles. We think we are making shovels. We think we are making matches. We think we are making refrigerators. But we are making new social conditions. And with that we are making new social problems. There can be no doubt to begin with—and this is the basic line that we always must throw down in any such discussion—that we are serving human life. We are at least doing that. The economic objectives of humanity haven't changed at all. Food and clothing, housing and transportation, agriculture, the supply of family life and reaching toward some form of social security, if there is any such thing on this planet—these have always been the same. Men have struggled for them. Whether they obtain them or not they struggle for them because there is something planted in man's mind that makes that struggle the great end and object of his existence. It is not what he wants, but what he gets in trying to get what he wants, that makes humanity what it is. But the conditions and the burdens of obtaining these common things have changed. Work is lighter. Burdens have been lifted off flesh and blood and laid upon steel and iron. You men are constantly doing that. The time consumed is less. Our forefathers worked twelve or fifteen hours a day. Our leisure is greater. Leisure is now an economic factor. We find now that men making things must have leisure in which to use them, that you can never build up a country like ours by keeping men at work all the time. The only market you have for the things you make are those men. And they must have leisure to go out and buy and use and consume the things which they make. The tool has been a great liberator of mankind in that respect. If we could measure up the free hours, the free days, the free minds, which men have gained as a result of the tool it would make a marvelous record. It is an important discovery we have made in this generation that the higher the cost of a thing, the less of it there is. And the less everyone has of it, the less everyone wants of it, and the less everyone can have of it. High cost means less wages, less to spend in the world, less of the things that we live by. But where production is less costly, made less costly by the tool, there is always more wealth, more money, more things to spend the money on, and more money to spend. More work also—not only the work that men have always done, but work that we have never done before, because now we are doing work never done before. Mass production is more than mass production. You could gather four million men together and not be able to perform some of the operations that are being performed by one machine in our shops today. Half the world's work today is new work made possible by the tool. Things we have never done since history began we are doing commonly now. It is more than the absorption of the old work by the modern tool. Not the tool coming in and saying, "You go home, I will do your work." But it is the creation of entirely new work to be done by men and constantly bringing more men in to do it. Of course, when I think about this I realize that there is a danger of falling into a deification and glorification of mankind, as Nebuchadnezzar did when he said, "See this great Babylon which I have builded." But I think the engineering mind is a fortress against any such mistake as that. We are not ignorant of the fact that the things we are doing today and inclined to sit back sometimes for a moment or two and congratulate ourselves upon, will appear twenty-five or thirty years hence as very crude and very simple and very ignorant beginnings. The future will reveal us as mere children playing with forces that were always at our hands and also battering against our minds

but never able to find entrance. We think that we are tooling up production. But our work goes beyond that. We are tooling up a new kind of society. We are pioneers of a greater liberation of industrial society. So far as we have gone, with all its undoubted benefits, we are already turning out problems with our products—problems as well as goods with our machines.

You know as well as I do that there are publications and demagogues in this country devoted entirely to the denunciation of the machine. And this by intelligent men, too. Sincere men. Sympathetic men and women. Sometimes we try to explain to them and show them by actual experience what happens through the improvement of the machine. But it is no use. There is a subtle hostility and suspicion which will remain with one part of the elder generation and, I think, will never be cured, but will not be any part of the heritage of the younger generation. We try to explain that there is labor-saving machinery—machines that lift the burden of labor off men and lift the cost of too much labor off the product, and that serve men in a way of leading them into work they couldn't possibly enter into without it. Instead of this progress being welcomed by the class I mention, it is constantly feared as a doom. The very people who protest are beneficiaries of the machine in the price of things they buy. The working man's wife would be living in a hovel were it not for a machine, but now she can buy a dignity of domestic life impossible to kings and lords in her grandmother's time. We can show that in the quality of things since the machine tool has come there is no comparison with those of older days. And the greater ease of the workers daily toil, its cleanliness and safety, and the increase of human dignity throughout industry—you can show how all these things spell social progress to all classes of people. You can show how the factory by taking home work out of the house allowed the home to become a home. Higher standards of life have kept pace with the development of machine tools in our industries. The working wage has gone up and the hours gone down and conditions improved and income increased. We show all these, but the answer comes with the time worn objections—"the machine has destroyed all skill and intelligence of the working man"; "it has made automatons of the laborer"; "it has degraded men"—and so forth, and so forth. They have the old untrue romantic ideas that craftsmanship has been destroyed by the machine. As a matter of fact, you and I know, or you ought to know being in your business, that there are more craftsmen today in proportion to the population than there have ever been at any previous period, and more craftsmen are needed today per thousand in the population than were ever needed before. There is actually more skill in what we call our common labor than what was required in much of the craft labor of this period which we think was so romantic. Mass production requires a very high degree of mass intelligence and as we ascend higher into the realm of technical knowledge that intelligence will have to increase more and more. And not only are jobs more numerous today than they were thirty years ago, as shown by the United States population statistics, indicating that we need more men to perform the nation's tasks than we needed thirty years ago, but we can show that the jobs they have are much better jobs and that the wages have increased four times since the Civil War, three times sine 1900 and twice since 1913. And we can show that our universities are crowded today, tens of thousands of students sent there by the needs of industry. The departments of metallurgy and chemistry and engineering and electrical science and business administration, and half a dozen others, are filled with men by tens of thousands who are simply learning a higher trade. And where are they to use their preparation and learning? The demand for work in industry makes it possible. They have been lifted by the tool and by the very necessity of social need to positions that they could never have reached without it.

All we can do in this general discussion is to fall back on the principle that nothing which does so much good to man can possibly be doing the harm to him that these people believe it is doing. There has been a great change, I notice, in the liberal papers on this question. Those that two years ago were assailing the machine and trying to drive it out by tax and license have now turned completely around. The facts have become too much for ranters. The thing is this, as long as the people use and find it to their advantage to use the things produced by these great tools there will be no chance for a backward step.

Now, these are problems. And you can let the internal machinery of your head get overheated about them. They are problems but they are not going to continue, and I will tell you why. They are simply the result of an incomplete process. The full attainment of this stage of advance movement in which we are now has not come. When the full attainment of our objectives does come all of these present day problems which seem so big considered alone will simply disappear in the fog. The problem of technological employment will be dead before most of us are dead. Technological unemployment will disappear in the great increase of technological employment. There is going to be a shortage of men when this country begins to take its stride. More than the government with its laws and more than finance with its control, the social solution of these things is in the hands of engineers and producers and you must go on. Having brought the people generally to this level of development you can't stop. You are the bridges over which humanity is passing and we are still on the bridge; we haven't arrived anywhere yet.

There are those who work for society for a humanitarian motive. They want to be good to men, to help men, and they are very often misled and mislead others. And there are those who work from a scientific motive, a practical productive motive, and they are the men whose work lasts. There is more humanitarianism in the cold scientific advances of today than there is in the sentimentality that would restrain it. These things to which people object are the very implements of the highest source of humanity. I think the social problem as it now stands is entirely in the hands of engineers and producers. I can't say that too often. They work at it from the right end. And they work at it every day. And they don't make speeches and wave their arms about it. They work at it in a manner which tells.

For what is the social problem? Is it not the difficulty people have in getting things they need to live as we think Americans ought to live? What makes it hard for them to get them? Is it not that these things are too costly? And what makes them costly? Is it not that they are too scarce? What makes them scarce? Is it not that there are not enough of them produced? And

(Continued on page 34)

BRIDGEPORT

The Bridgeport section of the American Society of Mechanical Engineers extended an invitation to the American Society of Tool Engineers and the Engineers' Club of Bridgeport to attend their meeting on Wednesday, January 20th at 8:00 o'clock P.M. in the Breakfast Room of the Hotel Stratfield. At the meeting R. W. Price, New England representative of the Norton Company, Worcester, spoke on two subjects; "Alchemists Hour Glass" and "Abrasives."

CHICAGO

The regular January monthly meeting of the Chicago Chapter A.S.T.E. was held at the Machinery Club January 11th. The speaker of the evening was Mr. Herman Niss of the Elgin National Watch Company who gave a very interesting address on the manufacturing methods used in the Elgin watch making plant. Step by step different operations and different manufacturing departments were explained as well as some of the difficulties encountered in working with such minute parts.

Mr. Booty, formerly Chief Draftsman with the Merchandise Development Division at Sears, Roebuck and Company has accepted a responsible position with the Wurlitzer Company at DeKalb, Illinois.

Mr. R. O. Hein, formerly with the Reliance Die & Stamping Company has been selected to succeed Mr. Booty at Sears, Roebuck and Company.

DETROIT

The January meeting of the American Society of Tool Engineers held in Detroit was attended by about two hundred and fifty members and guests. The speaker of the occasion was Mr. W. J. Cameron of the Ford Motor Company, who spoke on the subject "The Tool and Society" which met with a very highly enthusiastic response. It is published in condensed form, elsewhere in this issue.

Preceding Mr. Cameron's ,talk Mr. J. A. Siegel outlined a proposal in which a separate building association might be organized to finance a National Home or Club House for the A.S.T.E. This home is a fine old residence located in Detroit, large enough to house the National headquarters of the Society as well as a number of rooms which might be rented for offices. In addition, ample room would also be provided for Detroit Chapter meetings and kitchen facilities and other club accommodations.

Some interest was manifested on the part of members present but no definite decision was made as to future plans.

HARTFORD

Hartford Chapter of A.S.T.E. held their regular monthly meeting on January 27th at 8:00 o'clock p.m. in the Hartford Gas Company auditorium.

On this occasion a formal installation of officers was made. Committee appointments were announced and a short business meeting was held.

Two speakers addressed the technical session of the meeting. These men were from the United Aircraft Corporation and the Pratt & Whitney Aircraft motors and Chance Vought aeroplane plants. They spoke on tooling problems in the manufacture of aircraft motors and planes.

Future meetings of this chapter will be held on the fourth Wednesday of each month.

MILWAUKEE

The usual procedure was departed from at the January gathering. We have to take our hats off to Mr. Thomas Brown, Principal Boys' Trade and Technical High School, and his capable assistant F. W. Ziegenhagen for a very fine program.

After enjoying an excellent dinner in the school cafeteria, our members were conducted on a tour through the building, and we suddenly became conscious that there exists in Milwaukee an opportunity for every young man mechanically inclined to acquire a solid foundation to either a trade or Tool Engineering profession.

During the tour A.S.T.E. members were, of course, most interested in the tool room and machine shop. The machine shop is equipped with many of the finest precision machines known to the tool industry. It is also equipped with jig borers of the latest design, and an open side planer, hydraulically operated, which attracted widespread attention amongst the members because of its unusual design, and rigidity in operation.

After the tour of the school the group adjourned to the school auditorium where an open forum was conducted by Chairman Geo. A. Smart. Mr. Thomas Brown, Mr. F. W. Ziegenhagen and Mr. R. A. Radke, of the faculty, thoroughly reviewed everything we had seen.

Messrs. E. S. Houston, I. Schober and A. J. Dries, A.S.TE members and former Tech graduates, were asked by Chairman Smart whether or not their education at the school had helped them in their work. It is their opinion that a boy graduating from a Technical High school is equipped with a training whereby he is better able to secure a job be-

The Milwaukee Chapter meeting held January 14th was well attended. The above picture shows, left to right, A.S.T.E.ers Schoenig, Ziegenhagen, Smart, Johnson, Brown, Riedl, and Radke. The photo was taken in the Trade and Technical High School

Pittsburgh organizes eighth and largest initial A.S.T.E. Chapter. F. R. Lamb, National President, American Society of Tool Engineers; D. L. Shelly, Secretary; M. F. Judkins, Treasurer; J. R. Weaver, Chairman; Frank Curtis, Chairman Program Committee at the organization of the Pittsburgh Chapter.

cause of his more specialized course of studies.

During the course of the forum several prominent engineers and shop managers expressed their opinion of the school. Among them were Messrs. Harry Sedgewick of Cutler Hammer Inc., Arthur G. Seeger, Stanek Tool & Die Mfg. Co., and Art Schaefer, of the Le Roi Co.

Chairman Smart ended the meeting with a pep talk on the mid-winter rally at the Club Madrid.

PITTSBURGH

Friday evening, January 8th, was the date and the Westinghouse Electric and Manufacturing Company dining room was the scene of an organization meeting for the Pittsburgh Chapter of the American Society of Tool Engineers.

Following a dinner graciously provided by the Westinghouse Company, a meeting of nearly one hundred manufacturing executives present was called to order by Mr. J. R. Weaver, Director of Works, Equipment, Inspection and Test, of the Westinghouse Electric and Manufacturing Company. Mr. Frank W. Curtis, Manager of the Firthite Division, of the Firth Sterling Steel Company of McKeesport, Pennsylvania and Mr. Weaver had been instrumental in establishing this chapter of the A.S.T.E. Mr. Weaver and Mr. Curtis explained at some length the primary purpose for which the meeting had been called, told of preliminary work which had already been done and introduced the speaker of the evening, Mr. Ford R. Lamb, President of the American Society of Tool Engineers. Mr. Lamb outlined the early beginnings of the Society, explained the aims, the various activities and functions of the Society and also gave a complete statement of its financial condition and its operating budget.

After Mr. Lamb's discussion it was found that forty-five of the men present were ready to apply for membership in the Society immediately. Necessary application blanks were passed around and upon receipt of these, together with the initiation fees, it was voted to establish an official branch of the Society in Pittsburgh. An election of Chapter Officers was then held with the following results: Mr. J. R. Weaver, Chapter Chairman; Mr. D. L. Shelley of the Westinghouse Air Brake Manufacturing Company, Chapter Secretary, and Mr. Malcomb F. Judkins of the Firth Sterling Steel Company, Treasurer.

After a short talk by each of the officers some discussion of suitable meeting dates and places was held. The second Friday of the month was decided as the most suitable date to hold the regular monthly meetings. An announcement of this chapter's first regular meeting will be found on the Meetings page of this issue.

RACINE

The regular monthly dinner meeting of the Racine Chapter, American Society of Tool Engineers, was held Monday night, January 18th, at 6:30 P.M. in the main dining room at Hotel Racine. It was well attended, there being about eighty-five local engineers and guests present.

The guest speakers of the evening were, Mr. Charles J. Jennings, Research Engineer of the Westinghouse Electric and Manufacturing Company of East Pittsburgh, Pa., and Mr. E. A. Randall, Research Engineer of the Wisconsin Oxygen and Hydrogen Company of Kenosha, Wisconsin, and their talk was on "Welding."

Mr. Jennings' talk dwelt entirely on Electric Welding, Welding Equipment and Electrodes. During his talk, he pointed out several reasons why fillet welds should be made on certain jobs and the importance of why it was essential that butt welds be made on others to make the job stronger and to help eliminate or hold the crackage of welded joints to a minimum. This he illustrated fully by showing lantern slides on both small and very large welding jobs. He also talked somewhat in regard to his coming book—"How to Weld 29 Metals." This book covers practically everything in connection with the art of welding and is now being printed for distribution.

Mr. Randall talked entirely on Autogenous Welding, Flame Cutting, and on Compressed and Industrial Gases, and he illustrated by chart the manufacture of same, and after he finished his talk, he gave some demonstrations of liquid oxygen.

A discussion was held after the meeting at which time Mr. Jennings and Mr. Randall answered a number of questions asked by the engineers.

IMPORTANT NOTICE

The February meeting of Detroit Chapter, A.S.T.E., will be held at

BARLUM HOTEL

Dinner: 6:30 **Speaker: 8:00**

Parking on Cadillac Square, also parking lots on Brush near County Building, and Detroit Garage at National Bank Building.

REMEMBER THE NEW PLACE

BARLUM HOTEL—CADILLAC SQUARE

PATENTS

ASSIGNMENTS, LICENSES and ROYALTY CONTRACTS

By Everett G. Wright
PATENT ATTORNEY
Detroit, Michigan
Member Federal and Michigan Patent Bars

Ninth and concluding installment of this series on Patents.

General Considerations

There are four types of transfer of patent rights, namely: assignments, grants, mortgages and licenses. Assignments, grants and mortgages convey definite rights in a patent which affect the title of the patent and must be in writing and duly executed. An assignment, grant or mortgage of a patent will be void as against any subsequent purchaser or mortgagee for valuable consideration without actual notice thereof unless it is recorded in the Patent Office within three months from the date thereof or prior to such subsequent purchase or mortgage. Licenses, however, may be either oral or written and need not be recorded. Licenses should, however, be reduced to writing to eliminate possible controversy as to the terms thereof.

Assignments, Grants and Mortgages

An assignment is a conveyance of the entire right, title and interest in a patent, or an undivided part thereof, extending throughout every portion of the United States. Applications as well as patents may be assigned, and, the assignment of an application automatically carries with it the entire right, title and interest in the patent when it issues.

A grant is a limited assignment under which the grantee acquires the entire right, title and interest in a patent, or an undivided part thereof, extending throughout some specified part of the United States.

A mortgage of a patent is nothing more than an assignment or grant subject to a condition subsequent, and, when the mortgage is recorded in the United States Patent Office, the legal title to the patent is absolute in the mortgagee subject to defeasance upon fulfillment of the condition subsequent.

An assignment, grant or mortgage should be acknowledged before a notary public or other officer authorized to administer oaths, since such acknowledgment is prima facie evidence of the execution of such instruments.

Licenses

A license is a contractual relationship between the holder of the entire right, title and interest in an application or a patent, or an undivided part thereof, and some individual, firm or corporation in which definite terms provide for and permit the said individual, firm or corporation to make and/or use and/or vend the thing patented for a consideration and under such conditions as may be agreed upon. A license does not pass title to an application or patent and may be further defined as a right under a patent of less magnitude than can be acquired by an assignment, grant or mortgage.

A license may be exclusive or non-exclusive, assignable or non-assignable, and may carry with it provisions for cancellation or forfeiture, provisions for the payment of lump sum, percentage, maximum or minimum royalties, and contain such other terms, conditions, guarantees and warranties as may be agreed upon by the contracting parties in accordance with their respective equities.

Royalty Contracts

A royalty contract is an agreement, preferably reduced to writing, which defines the terms and conditions of a license and the respective rights of the licensor and licensee thereunder.

The royalty contract, being technical in its nature and subject to a wide selection and variance of its terms, should be drafted by competent patent counsel in order to avoid future difficulties in discharging obligations created under it and the possibility of unfavorable interpretation in the courts.

(Conclusion)

FEBRUARY CHAPTER MEETINGS

Chapter Meeting Announcements must be received on or before the 20th of preceding month. Omissions are the result of not receiving this information by this date—in time for publication.

CHICAGO

February 8, 1937—Business meeting at 6:15 P. M. Dinner: 6:45 P. M.
Technical Session at 8:00 P. M.
Machinery Club, 571 W. Washington Blvd.

Speaker: MR. J. C. KAZIMIER, Estimating Engineer, Chicago Molded Products Corporation.
Subject: "Plastic Molding."

A talking moving picture of the Bakelite Molding process will be preceded by an interesting exposition by Mr. Kazimier. The talking film is the property of the Bakelite Corporation Ltd., England, to whom we are grateful for its special use on this occasion. The January session was so well attended that considerable increase in attendance is expected at this interesting February meeting, and all are urged to make reservations with Mr. Willard Wilson, 1026 So. Homan Avenue, as early as possible.

CLEVELAND

February 16, 1937—Dinner: 6:30 P. M.—$1.00 per plate
Technical Session at 8:00 P. M.
The Colonial Hotel—523 Prospect Avenue

Speaker: MR. FRANK W. CURTIS, Manager, Firthite Division, Firth-Sterling Steel Company, McKeesport, Pa.
Subject: "Tooling For Carbides."

This topic will be fully illustrated, will outline the change in tool design trends made necessary to get the most out of carbides. This talk has been prepared especially for Tool Engineers. We are fortunate in having Mr. Curtis, being a member of the American Society of Tool Engineers, an authority on Tool Engineering for many years. He worked several years in the automotive industry with Ford, Studebaker and Lincoln in the shop, toolroom and tool designing. Was Western Editor of American Machinist, also research engineer of Kearney & Trecker Corpn., Milwaukee, Wis. Mr. Curtis has written books on "Tool Engineering," "Modern Gaging Practice," "Die Design," and is well known for his contributions to many trade publications. Make reservations immediately with Mr. G. J. Hawkey, Penton Building, Telephone Main 0112.

DETROIT

February 11, 1937—Dinner: 6:30 P. M.
Hotel Barlum

Speaker: DR. EDGAR DEWITT JONES, President, Federal Council of Churches. Pastor, Central Woodward Christian Church, Detroit. Eminent Historian and Orator of National Reputation.
Subject: "Abraham Lincoln"

This is ladies' night. A cordial invitation is extended to all the ladies of A.S.T.E.'ers who wish to attend this interesting non-technical session of Detroit Chapter. On this occasion the speaker is one of national reputation who will speak on a subject of great interest and timeliness.
PLEASE NOTE — NEW MEETING PLACE — BARLUM HOTEL

MILWAUKEE

Regular monthly meeting of the American Society of Tool Engineers will be held at the Republican House in the Colonial Room, February 11, 1937, 8 o'clock P. M. Open forum discussion conducted by Chairman Geo. A. Smart.

Speaker: MR. J. BRYANT, Greenfield Tap & Die Corporation.
Subjects: "Thread Gauges, Their Design, Uses and Inspection." "Threading Problems Regularly Encountered in Production, and Their Solution."

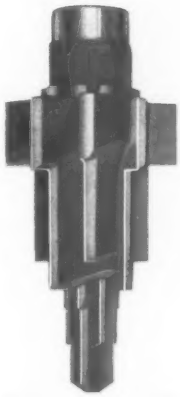
Tickets 75c upon admission.

PITTSBURGH

February 12, 1937—Dinner: 6:00 P. M.
Technical Session: 8:00 P. M.
Westinghouse Air Brake plant—Wilmerding

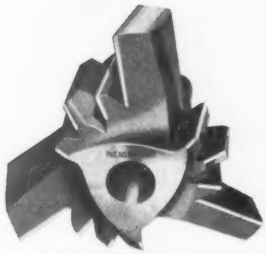
This, the first regular monthly meeting of the Pittsburgh Chapter, will be in the nature of a business meeting with announcements of committee appointments, etc. An appropriate motion picture on some technical subject of interest to Tool Engineers will also be shown.
All manufacturing executives of the Pittsburgh area are cordially invited to attend.

The ANSWERS to a "TROUBLE SHOOTER'S" PRAYER —



Machines Twelve surfaces, large diameter—3 inches.

Eclipse



Special long-life Multi-diameter cutter — machines five surfaces large dia. 4½ inches.

Integral Double Radial Drive for heavy duty counterbores, countersinks, etc.

Integral Square and Taper Drive for core drills.

Integral Double Parallel Drive for back spotfacers.

Dependable, economical production tools for counterboring, countersinking, spotfacing, multi-diameter boring and core drilling. Large stock of all standard sizes maintained. Ample facilities for designing and manufacturing special time-saving end-cutting tools.

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This Month's Cover . . .

The picture on this month's cover illustrates an outstanding surface broaching operation being performed on cylinder blocks in the plant of the Packard Motor Car Company in Detroit, Michigan. Two Surface Broaching Machines of the pioneer design were built by The Cincinnati Milling Machine Company, Cincinnati, Ohio. These broaching machines are said to be the largest broaching machines thus far built.

One of the machines, as illustrated in Figure 3, broaches the pan rail or bottom face of cylinder blocks, and also the bearing cap seats. The other machine, as illustrated in Figure 4, broaches the top or cylinder head surface. Both of these Cincinnati Hydro-Broach Machines are designed to perform these operations on both six and eight cylinder blocks. Both are equipped with a fixture and will accommodate whichever block happens to come along the conveyor line without the necessity for any change or attention on the part of the operator.

Neither of the operations mentioned above has been performed by surface broaching, except experimentally, before these machines were installed. The production obtainable per machine is between fifty and fifty-five cylinder blocks an hour.

As a result of extensive experiments, the broaching tools used are the inserted blade type. They have been carefully designed to remove metal to a depth of approximately $\frac{3}{16}$ inch, in the minimum amount of time and still produce the finished work pieces within unusually close tolerances for accuracy and flatness of surface and to a high degree of finish. The use of tungsten-carbide finishing tools is an important feature of these broaching machines.

As will be apparent from the illustrations, the broach rams move horizontally, the plane of the broaches being vertical. Figure 1 shows the fixture and broaching tools on the machine used for finishing the pan rail and bearing cap seats. Each cylinder block is slid from the conveyor into the machine fixture, where it is positioned against five foundry locating spots, and clamped. The operator then throws a lever to actuate a hydraulic mechanism which swivels the work-holding fixture upward through 90 degrees into the position shown in Figure 2, thus bringing the work into the broaching position.

Upon the completion of the broaching stroke, the fixture is returned to its original position. The operator then utilizes the time consumed in the return of the ram for sliding the finished cylinder block out of the fixture and loading a new block. Figure 4 shows the equipment used for broaching the top surface of cylinder blocks. The action of the fix-

(Continued on page 44)

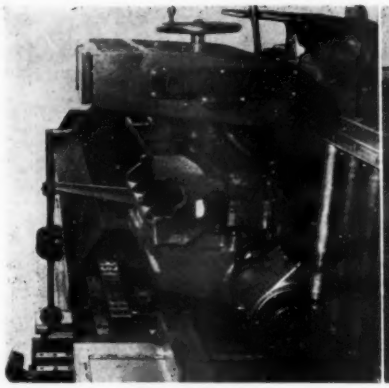


Figure 1.—The broaching fixture in the down or loading position.

Figure 2.—The same fixture in the up or broaching position.

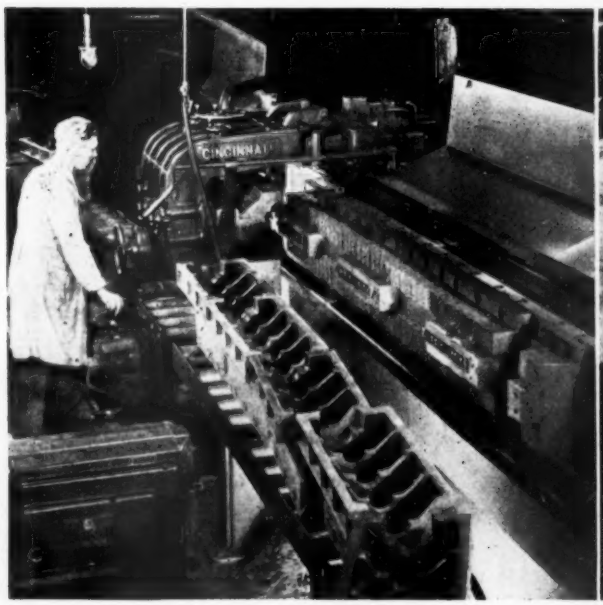


Figure 3.—This machine broaches the pan rail and bearing cap seats of six and eight cylinder blocks.

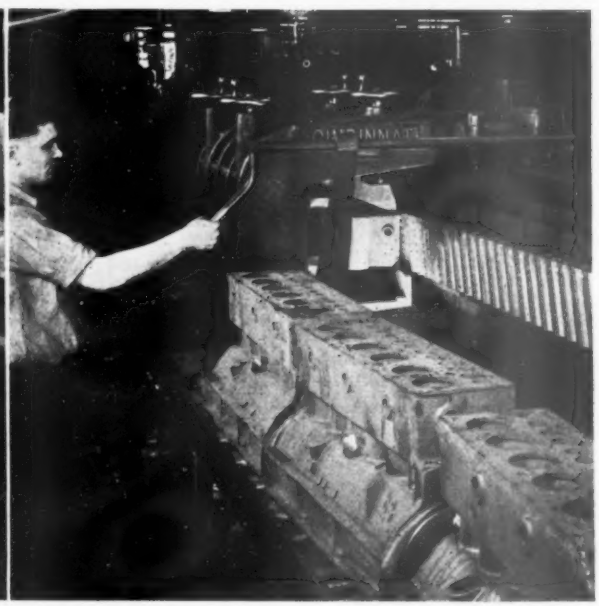
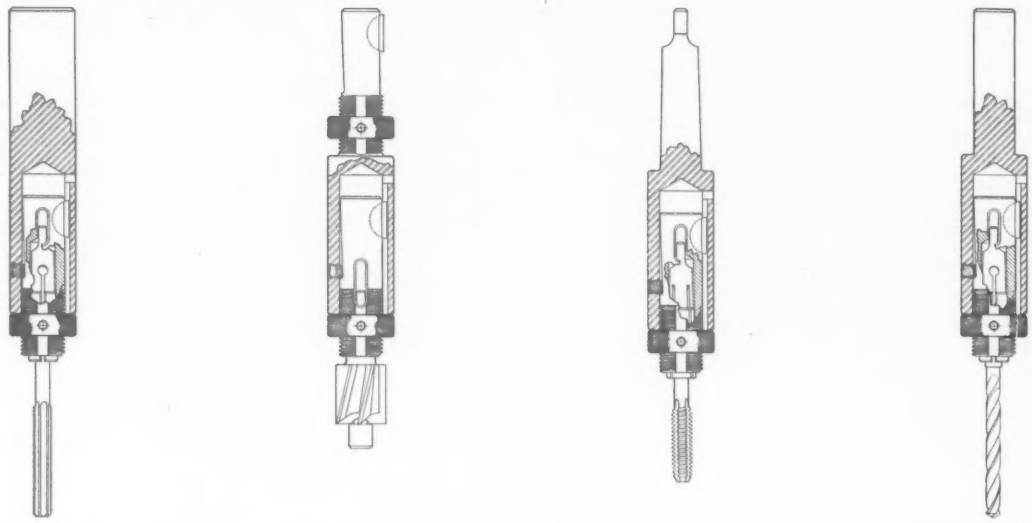


Figure 4.—Another Chicinnati Hydro-Broach installed at the same time broaches the top or cylinder head surface of the same blocks.

ADJUSTABLE ADAPTERS

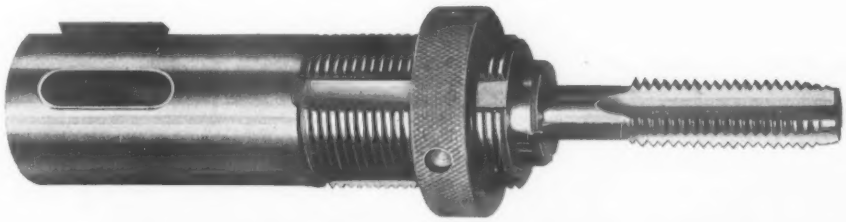


ADJUSTABLE EXTENSION ADAPTER ASSEMBLY

Scully-Jones Adjustable Extension Assemblies, Style "A", are designed for multiple spindle work.

To lengthen or shorten assemblies release the set screw in the nut and the body and turn the knurled nut to secure the correct adjustment.

These tools are standardly furnished with a Morse Taper Hole unless otherwise specified.



ADJUSTABLE ADAPTER ASSEMBLY

These Adapters have become so generally used that tools are now made with this type of shank. The purpose of this adapter is to permit of a quick adjustment of the tool without disturbing the entire set-up. By releasing the screw in the side of the spindle and the screw in the nut, the projection can be either shortened or lengthened by turning the nut. The screw in the side of the spindle retains the adapter in position and the key furnishes the drive for the adapter.

WHEN ORDERING: Specify catalog name of tool, style and part number. If tools longer than standard are required kindly give us the length desired.

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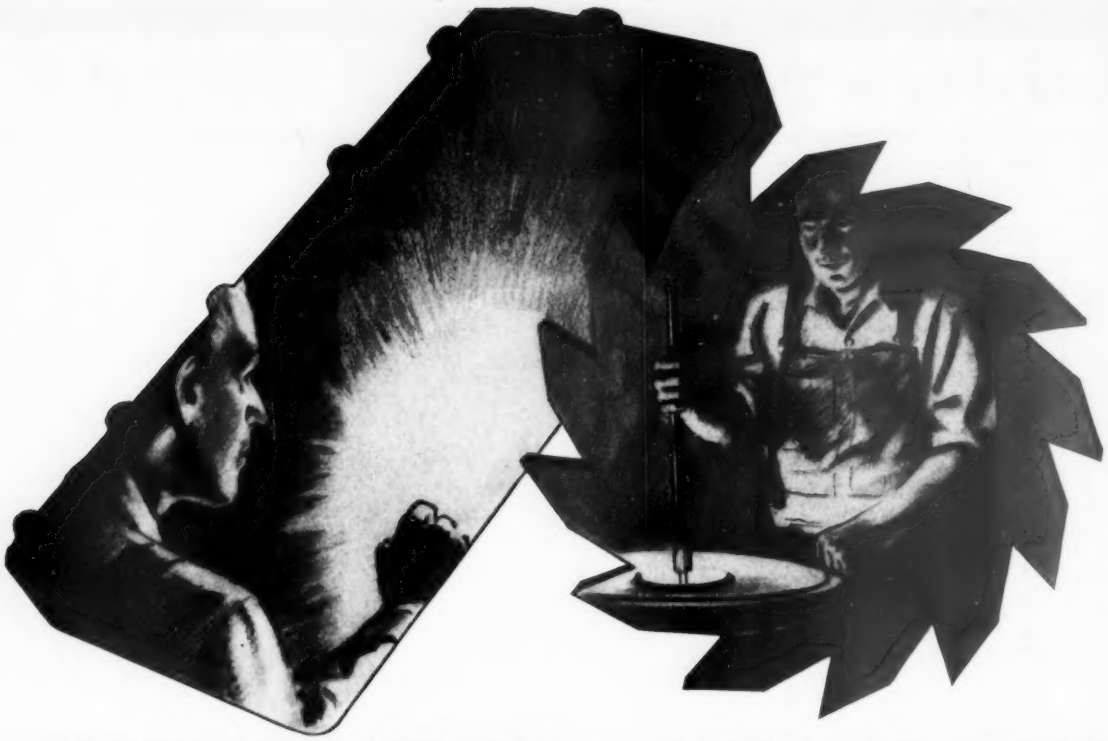

In CYLINDER HEADS *or* CUTTING TOOLS

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THERE IS A DIFFERENCE

There is a difference in today's high-compression aluminum alloy cylinder heads, whose strength is increased by carefully-controlled heat treating. Just as there is a difference in Morse Tools; which results partly from the close control of heat treatment at the Morse plant.

This is only one of the extra values that have made the name of Morse a symbol of long service and high efficiency. Unusually accurate grinding, step-by-step inspection, and Morse's years of tool-making experience each play their part.

What is the "toughest" job in your plant? Drilling manganese steel? Tapping aluminum? Try a Morse Tool on it, as well as on your regular work, and you'll prove to yourself that thousands of shop men are right when they say, "There is a difference."

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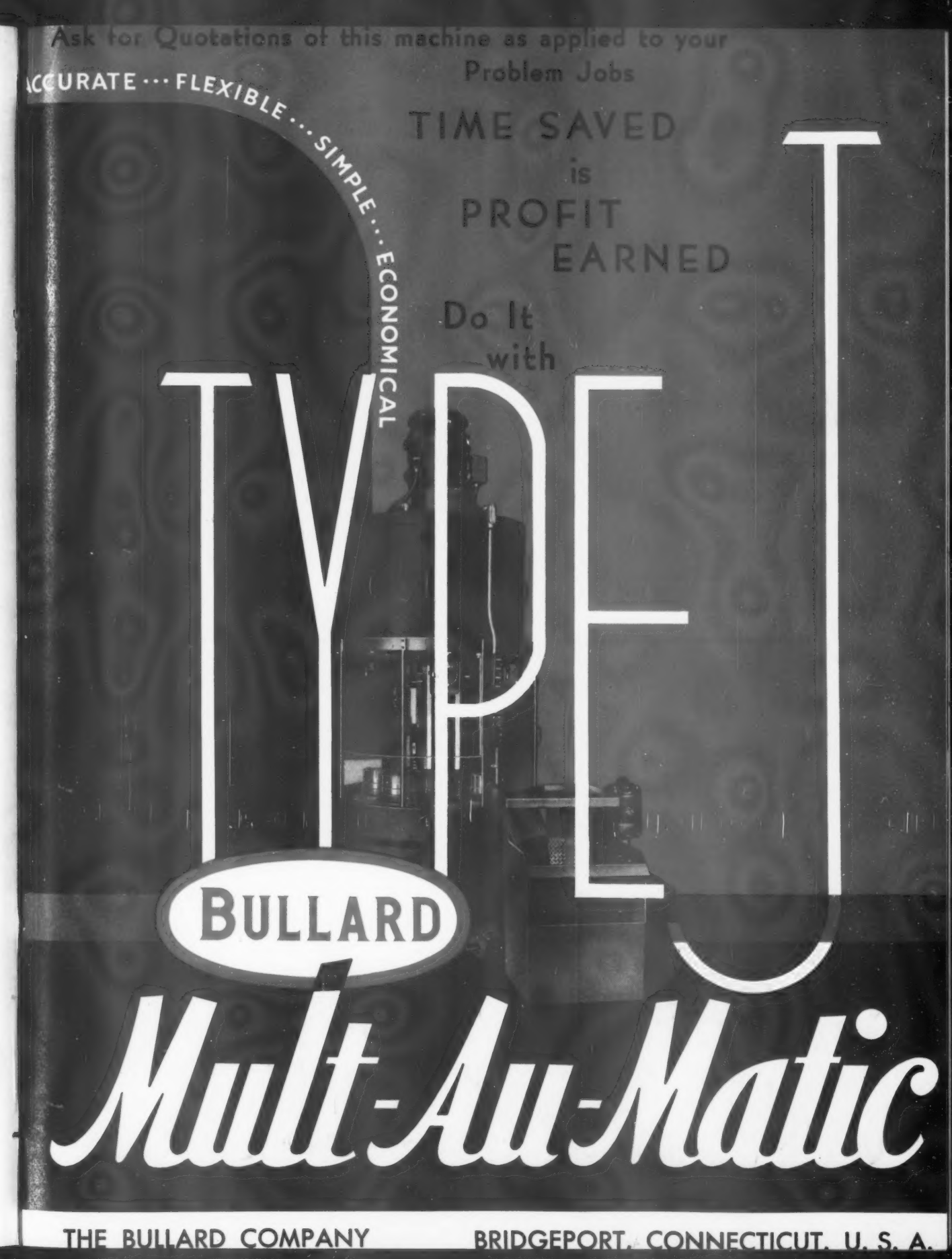
THE MORSE LINE INCLUDES HIGH SPEED AND CARBON DRILLS - REAMERS - CUTTERS - TAPS and DIES - SCREW PLATES - ARBORS - CHUCKS - COUNTERBORES - MANDRELS - TAPER PINS - SOCKETS - SLEEVES


Ask for Quotations of this machine as applied to your Problem Jobs
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TIME SAVED is PROFIT EARNED
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BRIDGEPORT, CONNECTICUT, U. S. A.

HANDY ANDY'S ..WORKSHOP..

I elect A. T. Femrite, of Milwaukee, to my Hall of A.S.T.E. Fame. (Read his letter in this issue and see why.) There's a member for you!

I also elect Roy T. Bramson (with laurels) to my Hall of A.S.T.E. Fame. "No new models but constantly improving," he has made the "Tool Engineer" an outstanding technical journal. If the fact escaped you, the January issue was ultra-modernistic, and compliments are still coming in. And Roy—none of your shrinking violet stuff, now. You print this.

▼ ▼ ▼

Paying dues is the first requisite of a good member. The Society has no other income; without dues it can neither operate nor exist. Our journal ("The Tool Engineer"), Standard Data Sheets, meetings — these and everything the Society does take money. Yet, it is doubtful if any other engineering society does so much for its members, considering the very nominal initiation fee and annual dues. Just figure it out for yourself, then —"Enclose check for $6.00, 1937 dues."

▼ ▼ ▼

Among others, a Christmas card from Bob Street gave me a thrill of pleasure. I like Bob, a fine fellow and a loyal friend. May his shadow never grow less. For that matter, I have never associated with finer men than are found in the A.S.T.E. Perhaps that is why it is going places.

▼ ▼ ▼

Wonder how Fred Beck is making out with his candid camera. Got anything interesting for "The Tool Engineer," Fred? Did I tell you Ed Beyma is taking up psychology?—or is it geology? Oscar Theander, methodical asst. chief at Midland Steel, went and got himself a pool table. Well, pool is an incentive to good English. (Keep the home fires burning, Oscar — you're going to be popular.) And say, Jay Bowen is getting to be one of the big boosters for the A.S.T.E. Good work, Jay!

▼ ▼ ▼

Mr. Waterman's article on Gears in the January issue was like a letter from an old friend. You see, I worked for "Benny" back in—well, skip it!—when he was superintendent of the Brown & Sharpe Gear Department, and I liked him. Now, I want to see him (and Louis D. Spence, also of B. & S.) join up with the coming Providence Chapter, A.S.T.E. And, gentlemen, my regards to the boys in the Old Home Town.

▼ ▼ ▼

One of our boys, O. W. Franke, had his picture in the current papers. Seems he went and got himself promoted to Master Mechanic at the Chrysler Plymouth plant. Well, you can't hold a good man down.

▼ ▼ ▼

Well, here's where we sell the ladies on the A.S.T.E. Detroit Chapter's next meeting—at the Barlum Hotel, by the way—will be ladies' night. We bring our wives and lady friends—and try to keep the ladies away! The speaker is Dr. DeWitt Jones (he is Nancy Brown's Chaplain, if you don't know it) who will talk on Lincoln. And, with Ida M. Tarbell and Carl Sandburg, he is one of the three outstanding authorities on Lincoln. Yes, there will be

(Continued on Page 40)

66 FIRTHITE TOOLMAKERS

are now supplying FIRTHITE Tipped Tools

In addition to our own FIRTHITE Sintered Carbide plant which manufactures a diversified line of FIRTHITE tools to serve every branch of the metal working industry, we have appointed these sixty-six outstanding concerns as agents to supplement our FIRTHITE service. They include machine tool builders who equip their machines with FIRTHITE Tools, special toolmakers and manufacturers of small tools tipped with FIRTHITE, and they all offer their services based on broad experience.

Price lists on FIRTHITE Standard Tools and Blanks are now ready for distribution and if you have not already received your copy write us.

AUTHORIZED SUPPLIERS OF FIRTHITE TOOLS

Bullard Company,	Bridgeport,	Conn.
Pratt & Whitney Company,	Hartford,	Conn.
Goss & De Leeuw Machine Co., The	New Britain,	Conn.
New Britain-Gridley Machine Co., The	New Britain,	Conn.
Stanley Works, The	New Britain,	Conn.
Apex Tool & Cutter Co., Inc.,	Shelton,	Conn.
O. K. Tool Company, Inc.,	Shelton,	Conn.
Waterbury Farrell Foundry & Machine Co.,	Waterbury,	Conn.
Axelson Manufacturing Co.,	Los Angeles,	Calif.
Chicago Rivet & Machine Co.,	Chicago,	Ill.
Scully-Jones & Company,	Chicago,	Ill.
Barber-Colman Company,	Rockford,	Ill.
Barnes Drill Company,	Rockford,	Ill.
W. F. & John Barnes Co.,	Rockford,	Ill.
Ingersoll Milling Machine Co., The	Rockford,	Ill.
Sundstrand Machine Tool Co.,	Rockford,	Ill.
Foster Machine Company,	Elkhart,	Ind.
International Mach. Tool Co.,	Indianapolis,	Ind.
South Bend Lathe Works,	South Bend,	Ind.
Morse Twist Drill & Machine Company,	New Bedford,	Mass.
Heald Machine Co., The	Worcester,	Mass.
Eclipse Counterbore Company,	Detroit,	Mich.
Gairing Tool Company, The	Detroit,	Mich.
Midwest Tool & Mfg. Co.,	Detroit,	Mich.
Morse Tool Company,	Detroit,	Mich.
Motor Tool Mfg. Co.,	Detroit,	Mich.
Production Tool Company of America,	Detroit,	Mich.
Tungsten Carbide Tool Co.,	Detroit,	Mich.
Whitman & Barnes, Inc.,	Detroit,	Mich.
Madison Manufacturing Co.,	Muskegon,	Mich.
Continental Machine Specialties, Inc.,	Minneapolis,	Minn.
Northern Machinery & Supply Co.,	Minneapolis,	Minn.
Star Tool Company,	Minneapolis,	Minn.
Davis Boring Tool Co. Div. of Larkin Packer Co.,	St. Louis,	Mo.
Acme Pattern & Machine Co.,	Buffalo,	N. Y.
Potter Tool & Machine Works,	New York,	N. Y.
Standard Gage Company, Inc.,	Poughkeepsie,	N. Y.
Davenport Machine Tool Co., Inc.,	Rochester,	N. Y.
Gleason Works,	Rochester,	N. Y.
Huther Bros. Saw Mfg. Co., Inc.,	Rochester,	N. Y.
Seneca Falls Machine Co.,	Seneca Falls,	N. Y.
Porter-Cable Machine Co.,	Syracuse,	N. Y.
Syracuse Supply Company,	Syracuse,	N. Y.
Textile Mill & Supply Co.,	Charlotte,	N. C.
American Tool Works Co.,	Cincinnati,	Ohio
Cincinnati Milling Mach. Co.,	Cincinnati,	Ohio
Cleveland Automatic Machine Co., The	Cleveland,	Ohio
Kelly Reamer Company,	Cleveland,	Ohio
R. K. LeBlond Machine Tool Co., The	Cincinnati,	Ohio
Lodge & Shipley Machine Tool Co., The	Cincinnati,	Ohio
Lyons Machine Company,	Cleveland,	Ohio
National Acme Company, The	Cleveland,	Ohio
Warner & Swasey Co., The	Cleveland,	Ohio
Monarch Machine Tool Co.,	Sidney,	Ohio
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Lovejoy Tool Company, Inc.,	Springfield,	Vt.
Hallidie Machinery Company,	Seattle,	Wash.
Rottler Boring Bar Company,	Seattle,	Wash.
Gisholt Machine Company,	Madison,	Wis.
Kearney & Trecker Corp.,	Milwaukee,	Wis.
Owen-Richards Company,	Birmingham,	Ala.
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★ LETTERS ★

A Literary Masterpiece

Milwaukee, Wis.

A.S.T.E.:

I enjoy everything about this Society; magazine, data sheets and writeups, but I am just one of those fellows that don't get around to write you people. But don't cry—here's wishing you a healthy, happy New Year.

To G. Zube, R. Brunner, A. Rylander.

P.S.—Enclosed find check for $6.00, dues 1937.

From

A. T. Femrite

The Answer

Dear Mr. Femrite:

As a writer, you are a master of brevity and a model for the entire Society. You said plenty in a few words; your postscript, especially, should be an inspiration to the entire membership. Wishing you the same and many of them, we are

Yours for Progress,
A. E. Rylander, Editorial
Ray Brunner, Secretary
Genevieve Zube, Asst. Sec'y.

▼ ▼ ▼

Waterbury, Conn.

American Society of Tool Engineers,
Detroit, Michigan.

Gentlemen:

Just a few lines to say "Thanx" for the "Due" card and also the "Standard" sheets. They are indeed nicely gotten out and should be a good help provided the boys keep themselves "posted" on what's the latest.

Now you very kindly mentioned me on your pages in the December Tool Engineer. Indeed it was quite flattering. I might answer that question of which Chapter—Bridgeport or Hartford and say—"Neither" for now—"Dynamic Detroit" for my Chapter for a while yet. I visited the preliminary and expected to attend the final organization dinner of the Bridgeport boys.

However—you know this overtime racket in Detroit? Well, here at the Waterbury Tool Co. we've been at it now two months hammer and tongs. The queer thing is—we're named a "Tool Company"—We don't make a darn tool for sales purposes and only use a few on our own production or standard commercial jobs.

We manufacture—"Hydraulic transmissions, etc." exclusively—Not tools. They are used extensively by the U. S. Government—for every imagineable purpose—hoisting mechanisms—steering gears, fuel pumps, etc., etc. Commercially they are for rolling mill and paper mill drives and other variable speed requirements too numerous to mention.

As chief checker my job is not one of authority but keeps me hustling now and then—and is very interesting. I have 5 men.

It's queer how one starts life in the machine tool or engineering line—say seven years—spends fifteen on tool design and then works back toward the original line.

Well again thanks for the past favors and regards to the boys with best wishes for a Joyous Christmas Season and Happy and Prosperous New Year I remain

Yours truly,
(Signed) Norman G. Brownsword

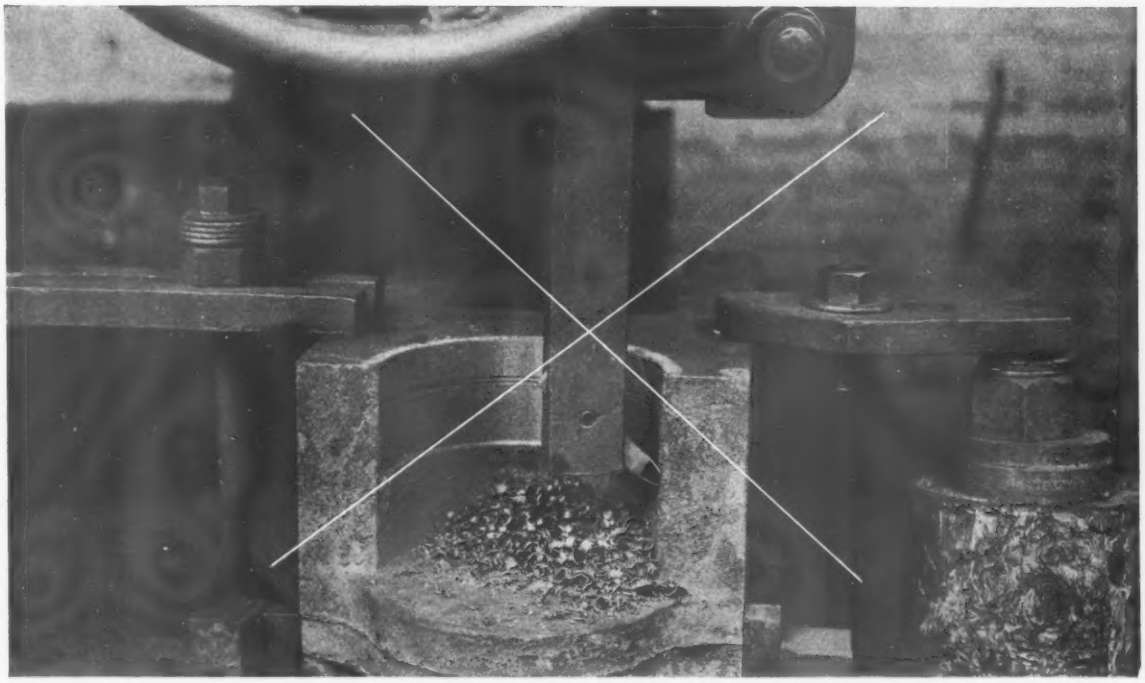
Buffalo Organizing A.S.T.E. Chapter

Just as this issue of The Tool Engineer goes to press, comes word from J. Don Reep of the organization of a Chapter of A.S.T.E. in the Buffalo, New York district.

More than thirty Tool Engineers of the area have signified their interest in becoming affiliated with the proposed Buffalo branch and a first meeting will be held sometime in February. The probable meeting place will be the Buffalo Athletic Club.

All Tool Engineers in and near Buffalo—and all readers of this publication, not already members of the American Society of Tool Engineers are particularly urged to attend this meeting. For further details as to the time, meeting place the date and the hour, please communicate with Mr. J. Don Reep, 76 Pearl Street, Buffalo, phone CLeveland 1110 or Grant 4658.

WHAT IS WRONG
With This Carbide Tool Set-up ?



Better Use Means *More Profitable* Use!

Get Maximum Savings From Your Carboloy Tools!

The value received from your Carboloy tool investment is in direct proportion to the extent to which Carboloy tools are correctly set up and applied on each operation.

Illustrated above is an excellent example of bad carbide tool practice that prevents maximum profits on the tool investment. Few Carboloy tools today are incorrectly applied to this extreme. However, there are numerous cases where adjustments in angles, or the use of heavier shanks, or perhaps more efficient tool holder design—to illustrate a few of many typical examples—will greatly increase the performance and savings of the carbide tools you use.

For those who wish to further increase production and decrease costs on Carboloy tool applications, we are now issuing a series of six engineering bulletins covering many important factors essential to correct Carboloy use. Both present users and prospective users will find these bulletins of value. Ask to receive these without obligation.

CARBOLOY COMPANY, INC.
Detroit, Michigan

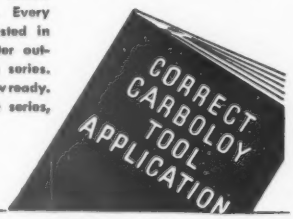
CHICAGO—CLEVELAND—NEWARK—PHILADELPHIA—PITTSBURGH

Canadian Distributor: Canadian General Electric Company, Ltd., Toronto, Ontario

CARBOLOY
REG. U. S. PAT. OFF.
CEMENTED CARBIDE TOOLS

Six Engineering Bulletins FREE—Upon Request

"How to Apply Carboloy Tools Most Profitably" might well be the title of a series of 6 Engineering Bulletins covering all factors essential to the correct use of Carboloy tools. Every production man interested in lower costs and greater output should receive this series. Bulletin Number One now ready. Send coupon for entire series, as issued.



Carboloy Company, Inc., 2983 East Jefferson, Detroit
Without obligation send Engineering Bulletin No. 1 and balance of series on correct Carboloy tool use, as issued.

Name_____ **Title**_____

Company_____

City_____ **State**_____

Precision Boring Tools

(Continued from page 13)

mond lapping disc for best and consistent results.

5—Change tools after a definite number of cuts. This number being determined by the appearance of the "scratchy" surface. By changing tools at the right time, more grinds are obtained per tool since less stock is removed per grind.

6—Tool adjustments between tool changes are not necessary.

Remarks

Several points brought out on other jobs may be of interest:

1—On a recently inspected job of boring a bronze bushing, Grade 905 brazed tools produced an average of 770 pcs. per grind, whereas a solid cylinder of Grade 905 Carboloy held mechanically in a hardened holder produced an average of 1500 pcs. per grind. The mechanically held piece allowed better heat dissipation and was free from brazing strains. We recommend mechanically held tips wherever possible.

2—Another job brought out the point that when the feed is increased and all other conditions remain the same, the radius at the point of the tool must be increased if the same number of holes per tool grind is to be expected in order to give greater area of contact and maintain the correct load per unit of area.

The feed on this job had been increased from .006" to .0095" per revolution and the point radius of the tool kept at 1/16". The result was that the production dropped to an average of 110 holes per grind. By increasing the radius to 7/64" the average was increased to 785 holes per grind.

This radius was determined by the following formula:

Comparative Radius Formula

d = Original depth of cut = .007 inch
f = Original feed = .006 inch per rev.
r = Original radius = 1/16 inch
F = New feed = .0095 inch per rev.
R = New radius = To be determined
D = New depth of cut = d

$$\frac{d \times f}{r} = \frac{D \times F}{R}$$

$$R = \frac{r \times F}{f}$$

$$R = \frac{.0625 \times .0095}{.006} = .099 \text{ approx. } \tfrac{7}{64} \text{ inch}$$

Did you hear about the A.S.T.E. Club? Well, it's still on the fire.

Application-Precision Boring

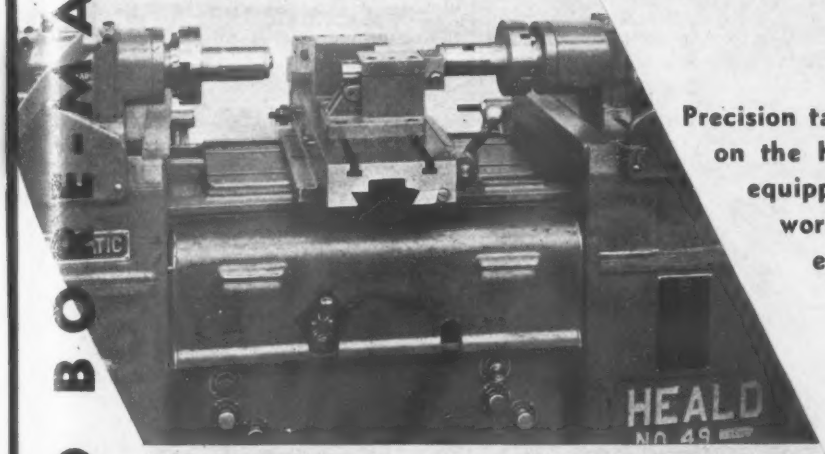
(Continued from page 15)

Through hydraulic control it is comparatively simple to work out (1) automatic cycles of rapid traverse from loading to boring position; (2) automatic slowdown to boring feed; (3) still further reduction, if necessary, to facing feed; and (4) complete stop to allow spindles to come to rest before the table automatically returns at rapid traverse to rest or loading positions. With hydraulic pressure in the machine proper it is possible to use this power for hydraulic clamping of work as well as for transverse or rotary hydraulic indexing of fixtures. The base machines are of rugged construction in which particular attention is paid to the elimination of vibration as previously mentioned. Any auxiliary units such as hydraulic pumps or electric motors which may introduce vibration usually are carefully insulated from the machine proper. The boring spindles following closely the design of high speed grinding spindles are improved still furth-

(Continued on page 40)

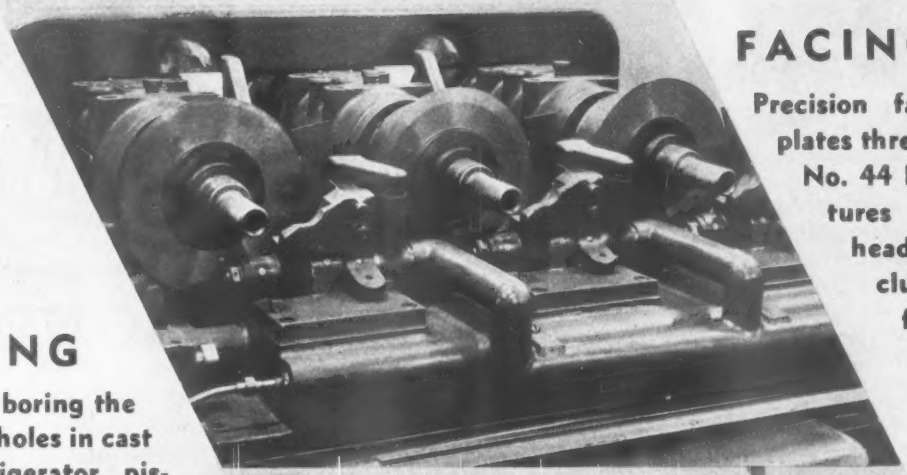
HEALD BORE-MATICS for Precision Finishing

Heald Bore-Matics are designed to handle not only precision boring jobs, as the name implies, but other operations — precision turning, facing, grooving — just as efficiently. They can be tooled up to handle any one of these operations separately or in any combination as a multiple operation.



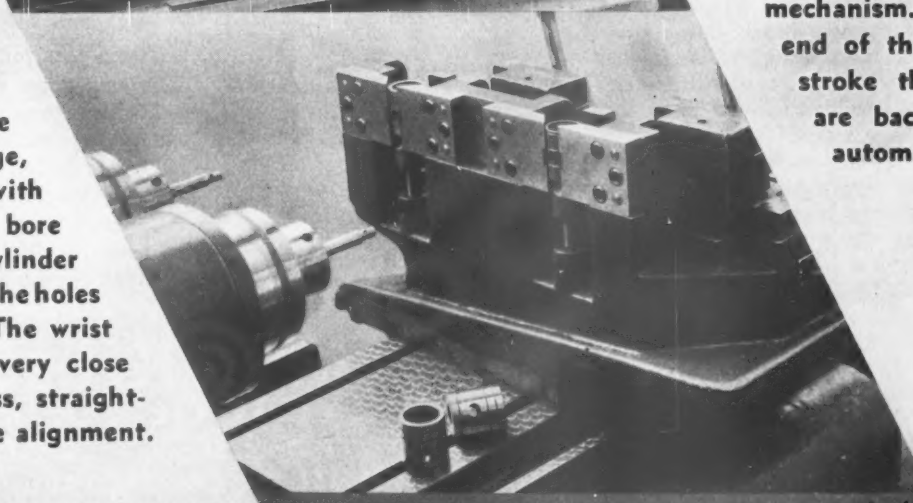
TURNING

Precision taper turning brass air brake valve bushings on the Heald No. 49 Bore-Matic. The machine is equipped with two boring heads for holding the work so that while turning a bushing at one end, another bushing can be loaded at the opposite end. The two turning tools are mounted on a two-position hydraulic cross slide which indexes the tool for each bushing.



FACING

Precision facing cast iron clutch plates three at a time on the Heald No. 44 Bore-Matic. Rotating fixtures attached to the boring heads hold the work. The clutch plates are located from the bore by plugs having bayonet slots which engage with a fixture clamping mechanism. At the end of the facing stroke the tools are backed off automatically.



BORING

Precision boring the wrist pin holes in cast iron refrigerator pistons two at a time on a Heald No. 48 Bore-Matic. Pistons are located dome downward on a knife edge, the holes are lined up with the boring spindles by bore centering plugs and the cylinder walls are squared up with the holes by means of V blocks. The wrist pin holes are bored to very close limits for size, roundness, straightness and held in absolute alignment.

THE HEALD MACHINE CO., Worcester, Mass.

The Tool and Society

(Continued from page 18)

why are there not enough of them produced? Because it is still too expensive to produce all we ought to have to supply every family in this country. The crux of the social question is production, not distribution. That is one of the wisecracks people make because they don't think about these things far enough. They say, "Well, the trouble is over-production." But the other man sees that there is something wrong about that. He says, "It can't be over-production, we can't have too much of any of the wealth of life." And the wealth of life is the things that men make and use, that is the only wealth, not money. The crux of the problem is production and not distribution. This nation has never yet produced enough for its own people. It will never produce enough until it deliberately sets itself to the job of producing more. I say deliberately, just as if you were making a serum for a deadly disease; not primarily for profit but to get the job done and to see that every person who needed it was supplied. There are great areas of our country that haven't the simplest things of life as we think people ought to have them. And we will never be a country to be entirely proud of until we deliberately go to work as a national service to bring our production methods to such a stage of efficiency that we can make it flow far enough to reach the last family on the last acre and the poorest family in the last street. Production will break down the costs of things, it will broaden the flow and lengthen the flow to these people, and you men who are supplying the tools for that are helping production break down the cost, and the pressure of production, the very pressure of production and low cost, will absolutely force distribution.

We are going to repeat in our social engineering what we have discovered in our production engineering—the future-clearing in paradox that the less you charge the more you can pay, the more you will make, and the more you will have; and the more you make the less you can distribute it for. The mechanical and the social principle grow out of the same stem. That is why I am not looking to sociologists or to statesmen or moralists for the solution of the social question. I am looking to the production men, to the engineers, to those who deal with good honest stuff and mold it into shape to serve the common life of our people. I think we are raising a generation of men, mature men, middle aged men and young men who do see this and whose work will only confirm the truth of it. Money-minded men don't see it. Engineers and production-minded men instinctively see it. It is part of the natural equipment with which Almighty God sent you into this world. I thank you very much for your courteous attention.

MEMBERS

Please Take Note

▼

Remove from your Standards Book, or mark cancelled — the Sundstrand data sheet covering the Sundstrand 10" Lathe. This sheet will be replaced about April 1st.

Production Perspectives

News of Mass Manufacturing from Everywhere

Despite the unsettling effect of the General Motors strike, America's **mass production** industries are on the march. True, there have been a number of stop orders, some suppliers have been faced with the difficulty of making room for raw materials, which were to have been used in completing orders now stopped BUT—the **feeling** on the part of everyone "in the know" is **definitely optimistic.** From many different sections of the country "The Tool Engineer's" reporters hear of **increased orders, new plant** building **programs** and a **good sized back-log of unfilled orders**—many of these dating back to 1936.

Railroads started spending in 1936 and **now in 1937** they **are increasing appropriations** for new equipment and machinery. Atchison, Topeka & **Santa Fe will spend some $40,000,000** it is reported, while **Illinois Central will shortly be in the market for $9,000,000 in new equipment. Steel,** also, is **spending huge amounts.** Topping this list is **United States Steel** Company who **will spend $60,000,000** in the Pittsburgh area in modernizing and new equipment. **Cleveland, Baltimore, Birmingham, Chicago and possibly Loraine are other cities that will benefit from this huge program. Republic Steel Company,** now third in size among the steel giants, **is reported** to be **spending $15,000,000** in new plants, etc. **Industrial Rayon Corporation,** it is reported, **plans** an **expenditure** of **several million dollars in Cleveland and Plainville,** Ohio, plants. **Penn Electric Switch Company is completing a new factory** and office **at Goshen, Indiana.** Facilities at the Des Moines plant have been outgrown, it was stated. Over **at Anderson, Indiana, the Pierce Governor Company** have **added to their facilities to meet a greater demand for their governors for Diesel and gas engines.** In Chicago, the **Shipman-Ward plant** on Montrose at Ravenswood Avenue, **was purchased** by the **Diesel Equipment Corporation. Webendorfer-Wills** Company **at Mount Vernon, New York,** are **building a new addition** to their plant for increased manufacturing facilities for their web reel-fed offset printing presses. **The Excel Projector Company** of Chicago has **moved into a new factory building** at 4234 Drummond Place. **Expanding business** of this firm has **necessitated day and night work** to fill the orders. **Wayne Lock Company in Detroit,** manufacturers of padlocks, bicycle locks, etc., are **planning to produce a line of auto accessories,** it is reported.

New England machine tool builders are **in excellent shape** "with a continuation of a rising demand for all classes of equipment"—according to Clayton R. Burt, President of the Machine Tool Builders Association. **Employment figures** in the **western Massachusetts** area **increased** by 5,713 in 1936 over 1935. The seamen's strike, now settled, it is anticipated, will be a strong factor in bringing about further increases in business volume and employment in this area. A number of plants in New England seem to be unaffected, and continue at full tilt. An example is the **Westinghouse** plant **at Chicopee Falls, Mass.,** which **is said to have sufficient business to continue present rate of production throughout 1937.**

TRY-OUTS

"I asked Homer* if there were any Tool Engineers in the Bible, but he hadn't read the book so he was no help to me. St. Patrick, for example, might have been an Engineer — he invented the worm drive. And then there was Elias who invented automotive engineering and went home on high. . . .

"A lady was giving a dinner party and somebody gave her some field mushrooms. She wasn't quite sure whether to use them or not, but she said to the cook, 'We'll cook these mushrooms, and before dinner I want you to feed some to the dog and if the dog is all right you can serve them to the guests.' So during the dinner the cook came and told the lady that the dog was all right, so she served the mushrooms to the guests and everybody enjoyed them. But about the time the ice cream was served the cook came in and whispered to the lady, 'The dog is dead.' And the lady went to the telephone and called up the doctor, and he came over with his stomach pump and removed the dinner from all these guests. And the lady went out in the kitchen and said, 'Where is the dog? I want to see him.' And the cook said, 'He is out there on the street where the car hit him.'

"Some time ago I was over to Cleveland at the Post-Graduate Medical Convention. When the toastmaster got through introducing me I told him that at the clinic that afternoon there had been some questions handed in and they hadn't been answered, and he asked me to answer these questions; and if you will please imagine that I am a celebrated medical authority (which I am not at all) and that you wrote out these questions and handed them in to me to answer, you will have the idea.

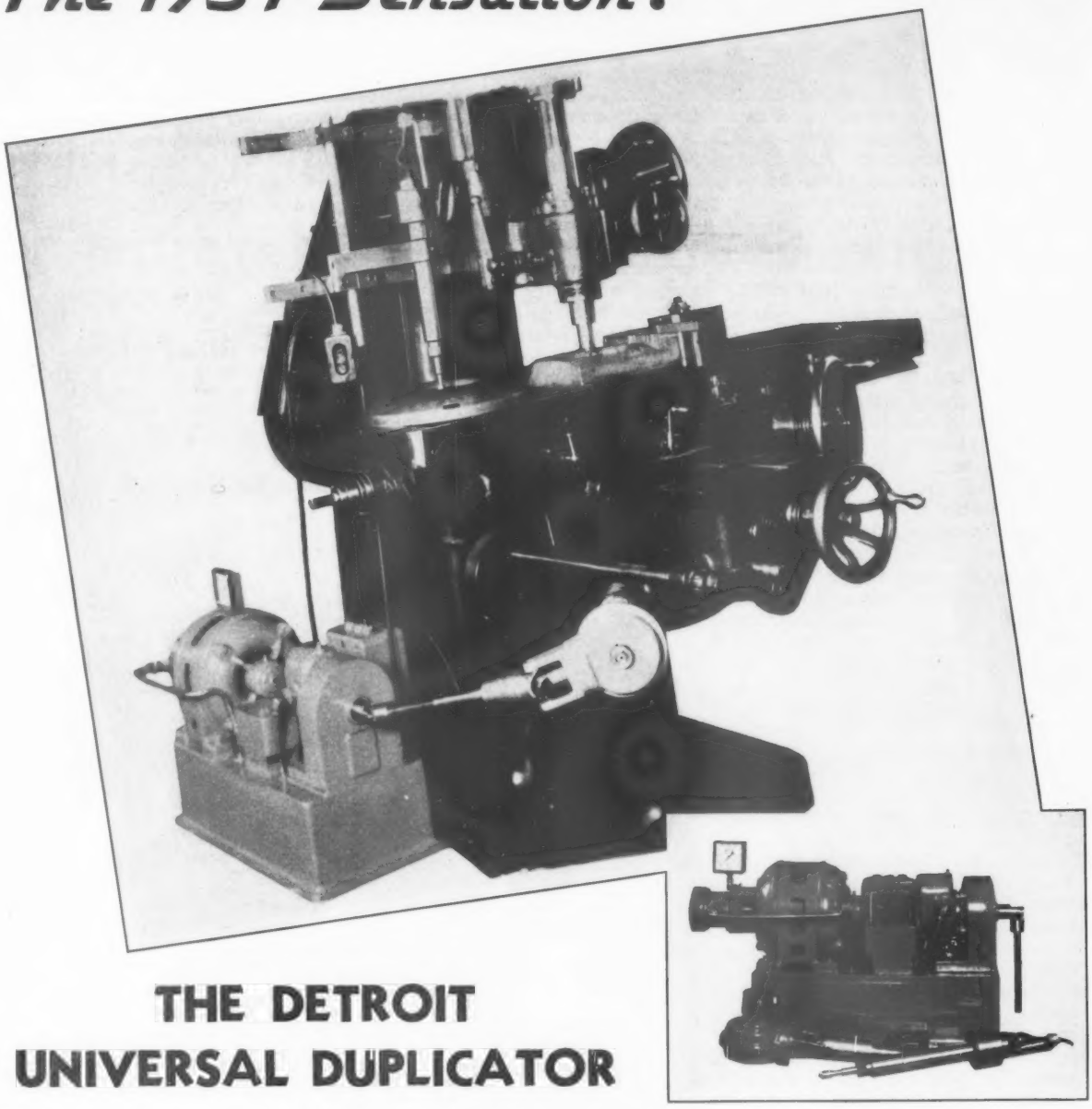
"Question: What do you know about the vitamins? Answer: They are a, e, i, o, u, and sometimes w and y. They are found in Campbell's soup. Question: What is bacteria? Answer: Bacteria is the rear entrance to a cafeteria. Question: In bathing my baby how can I tell whether the temperature of the water is right? Answer: If the baby turns red it is too hot, if it turns blue it is too cold. Question: What is pelican fever? Answer: Don't confuse the pelican with the penguin, the curious little bird that walks as though it had just climbed out of a rumble seat. You know that poem about the pelican. 'A curious bird is the pelican, his bill holds more than his'—well, you know the rest. The pelican fever is like the parrot fever, only the bill is much larger. Question: How can I avoid falling hair? Answer: Keep out from under it. Question: Do you advise the use of alcohol? Answer: I most certainly do. Seventy-five per cent of all the diseases are caused by germs that get into the lining of the stomach, and if you use alcohol it eats away the lining of the stomach and the germs have no place to go. I hope you will find these medical suggestions of great benefit to you in your work.

"Now, another fear that we all have is, the fear of the displeasure of the group. What will the neighbors think? Will they think well of us? One man here would feel greatly upset if he thought other members of this group or other groups didn't think well of him. We are anxious for the good opinion of the people. We very greatly fear their displeasure. We attempt to put

(Continued on page 38)

* Homer Bayliss—Detroit A.S.T.Eer.

The 1937 Sensation!



THE DETROIT UNIVERSAL DUPLICATOR

The machine every tool shop has been waiting for. It does the work of much costlier tools. It does the work of:

Automatic Die Sinking — **Automatic Turning**

Automatic Die Making — **Automatic Shaping**

and numerous other operations. No shop can afford to be without this wonderful machine.

Built by

GIERN & ANHOLTT TOOL CO.

DETROIT — GATCO — **MICHIGAN**

GATCO

Builders of Carbide Boring Equipment, also Rotary Jig and Pilot Bushings.

Try-Outs

(Continued from page 36)

up a good front. A little boy started to school in New York City and when he came home the first day he said, 'Aw, they ask too many questions. They asked me where my mother and father were born, and where I was born. But I didn't tell them where I was born. I didn't want to tell them I was born in no Women's Hospital. They'd think I was a sissy. I told them I was born in the Yankee Stadium.'

"Fear of what others think is one reason why we have all these Beauty Shoppes. A woman met a friend. This friend was very homely. A woman has the privilege to be homely, but she abused the privilege. She looked like an accident going somewhere to happen. And the lady said, 'Where have you been, dear?' And the friend said, 'I have been to a beauty parlor.' And the woman said, 'You didn't get waited on, did you?' This was the same woman who had her face lifted three times to correct a double chin and the skin was so tight that when she sat down her eyes closed.

"I do not mean the desire to appear well is not a natural one. It is a very laudable ambition. We can't disregard what folks think or say. A man married a girl and her twin sister came to live with them. His friend said, 'How do you tell them apart?' And he said, 'I don't, the other one just has to look out for herself.' You can't take that attitude toward life. You have to think of what other people say, so we have this fear of what the neighbors will think. Let me suggest three undesirable classes of neighbors. First, there are the Jeremiahs who are always discouraged. Everything is wrong. You give them a choice of two evils and they take both of them. You hear them say, 'I always feel bad when I feel good because I know I am soon going to feel so much worse.' They mean well enough but it is a great mistake to take them too seriously. Nothing is ever as bad as it seems to be. There was the minister's son who learned to play solitaire, although it was forbidden in his father's house. He had just won a game in his father's study when he heard his father coming, and he looked around for a place to hide the cards and he slipped them in his father's baptismal gown and forgot about them. The next day was Sunday and the father put on the gown and went down to the river for baptisms, and as he waded out into the water and the current reached the pocket the cards floated out in order, the ace, king, queen, jack, and ten of hearts. His wife was standing on the bridge with the deacon and she said, 'Oh, what can we do to help father?' And the deacon said, 'With a hand like that father doesn't need any help.' Nothis ever as bad as it seems to be, and it is a great mistake to take it seriously.

"The second class of undesirable neighbors are the fixers. They not only are dissatisfied but propose to do something about it. And they always know just what should be done—that is one of their characteristics. There was a man who had a very dumb wife. She was muscle-bound above the ears and he was trying to teach her to play golf, and he was talking and talking, and she said, 'Don't talk so much, you will drive me out of my mind.' And he said, 'That wouldn't be a drive, that would be a putt.' They were out riding one day and a policeman stopped him and he said, 'I am going to run you in on three points, exceeding the speed limit, running past a red light, and talking back to an officer.' And his wife said, 'Oh, he isn't responsible, officer, he's drunk.' She fixed it."

Quoted from an address by Charles M. Newcomb, given before a Detroit meeting of A.S.T.E.

Next Month

"The Tool Engineer" will deal, largely, with the subject of "Technical Aspects of Machine, Tool and Fixture Design."

Have you any problems or questions to consider in this important issue? Send them to the editor, now.

Model 10 Automatic Stub Lathe Improves Accuracy And Finish

Formerly special lathes were used for turning, facing and chamfering operations on the differential carriers shown in Fig. 1. Grinders were required for finishing

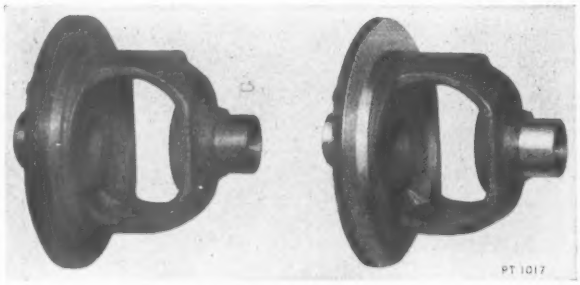


Fig. 1 — Malleable iron differential carriers before (left) and after finish turning.

operations. Now these parts are finished on two Sundstrand Model 10 Stub Lathes like that shown in Fig. 2, and grinding is eliminated. Operations are:

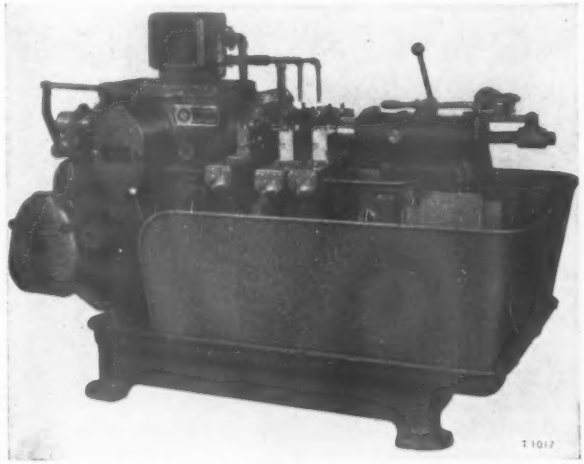


Fig. 2 — Sundstrand Model 10 Automatic Stub Lathe tooled for high production, accuracy, and finish on differential carriers.

finish turn bearing seats and ring diameter, face and chamfer flange, face shoulders. Seven cemented carbide tools operate simultaneously, with fine feed and high surface speed. Run out and limits are held to .0005″.

Compared to the old equipment, Model 10 Automatic Stub Lathes are easier to set up and operate. Their pick-off gears provide the exact combination of speed and feed most effective for this work. The high rates of rapid approach and quick return in their smooth running automatic operating cycle increase production. Their rigid one-piece frame maintains exact alignment between accurately mounted spindle, hardened steel ways, and heavy tailstock. This, coupled with precise control of tool movement, improves the accuracy and finish of the surfaces machined.

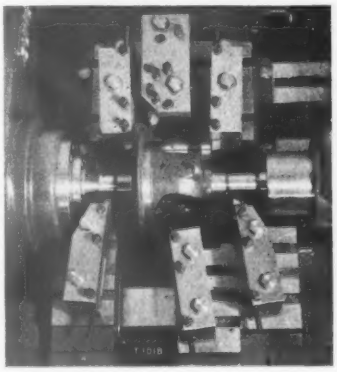


Fig. 3 — Close-up of tooling. Note two front carriages which move in opposite directions.

Sundstrand Model 10 Automatic Stub Lathes are cutting costs and improving machining on many other work-pieces, may be able to do likewise on some of yours. Consult our Engineered Production Department for reliable estimates. Write today for latest bulletin on the Model 10 Automatic Stub Lathe.

Application—Precision Boring

(Continued from page 32)

er for truer running qualities and added rigidity. Force-feed lubrication of all moving surfaces is used normally to increase smoothness of operation.

I think you will all agree that this method of precision boring or what we might term "production fly cutting" is without doubt the most accurate method that can be found to produce a hole, both for accuracy of the hole itself as regards its size and roundness and also as regards the relationship of this hole with some given surface. There is no doubt but what this new method of machining holds great promise and is probably bringing about more revolutionary changes in machining practices than have been known for some years.

Handy Andy's Workshop

(Continued from page 28)

One of the boys (he modestly prefers to remain unknown) will give a free dinner ticket to any A.S.T.E. meeting to the member who can join a single line running once only through each line of the following diagram. See unfinished key, Fig. 2. Send answers to Handy Andy, c/o "The Tool Engineer." First correct solution gets the prize; honorable mention for also-rans.

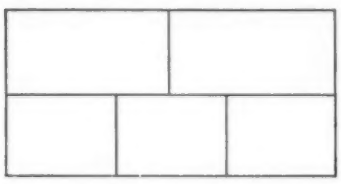


FIG - 1

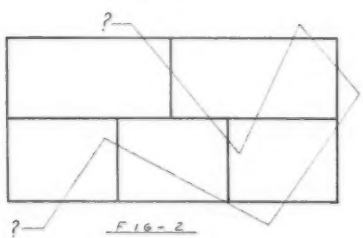


FIG - 2

H.A.

A.S.T.E. Five Years Old in April

The next national business meeting of this Society in April, 1937, will mark its fifth anniversary.

Fourth Set A.S.T.E. Standard Tool Engineering Data Sheets To Be Mailed Soon

Announcement has been made at A.S.T.E. Headquarters in Detroit that the fourth set of A.S.T.E. Standard Data Sheets will be mailed in the near future

The attractive, substantial three ring binder for keeping a permanent file of these valuable and important data sheets is available to A.S.T.E. members at $1.25 each. This price includes suitable gold lettering on front cover and in addition your name imprinted in gold also. When remitting add parcel postage charge for two pounds to the postal zone in which you reside.

Readers of "The Tool Engineer"—who are interested in aiding the establishment of a branch of the American Society of Tool Engineers, should communicate with Roy T. Bramson, Chairman New Chapters Committee, 2842 W. Grand Blvd., Detroit, Michigan.

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ROTATING AIR CYLINDERS

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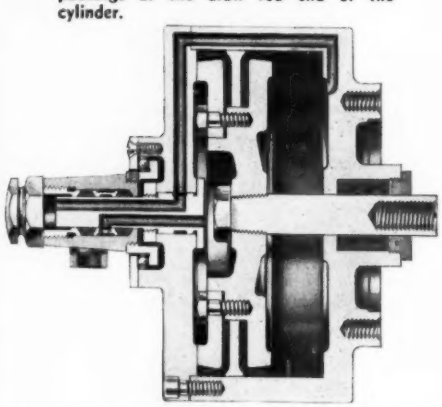
Cleveland Representative
CLEVELAND DUPLEX MACHINERY CO., INC.
Peaton Bldg.
CLEVELAND, OHIO

Sectional view of model "R" Rotating, Double Acting Cylinder showing Piston Cup Packings, interchangeable ball bearing Air Shaft, and self adjusted by air packings at the draw rod end of the cylinder.



"LOGAN" double acting Model "R" Cylinders (Sectional View Illustrated) are designed for the economical operation of Air Chucks, or other air operated devices, required to be mounted on a revolving spindle.

All working parts are hardened and ground. Loss of air by leakage is reduced to a minimum.

Model "R" Cylinders are regularly made in sizes from 3" to 20" diameter. Other sizes are made to order. Write for complete information.

LOGANSPORT MACHINE INC., LOGANSPORT, IND.

TRADE O K MARK

TEE SLOT BOLTS

FOR USE ON PLANERS, BORING MILLS, MILLING MACHINES OR OTHER MACHINES WITH SLOTTED TABLES

THESE bolts are manufactured in the same factory as the well-known "O. K. System of Inserted-Blade Metal Cutting Tools," and with the same relative care. They are forged of special medium carbon steel, heat treated for maximum toughness. The heads are milled accurately to size. With each bolt is furnished an O. K. nut of special design, in which nut and washer are incorporated into one unit. Having nut and washer integral eliminates time which is often wasted trying to keep tabs on separate washers. This flanged nut is made of the same tough steel as the bolt itself.

"O. K." Tee Slot Bolts may be obtained in any length, from 2" long to 24". A circular completely describing and pricing the line will be sent you on request.

THE O. K. TOOL CO.,
Shelton, Conn.

Detroit Student Chapter Holds a Raffle

During the January meeting of the Detroit Chapter of A.S.T.E., members of the Detroit Student Chapter circulated among the audience with chances on a prize.

The Senior members bought many chances "at ten cents each or three for a quarter." The boys, it is reported, augmented their Chapter Treasury, nicely.

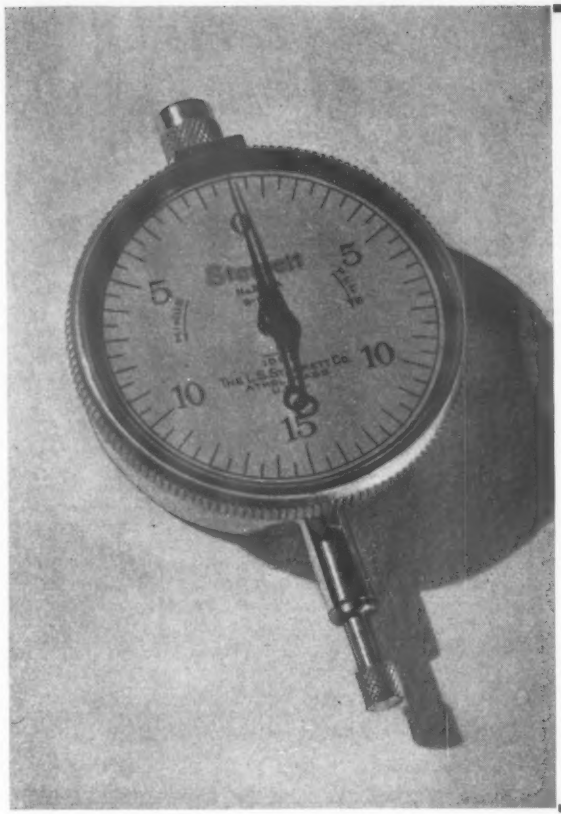
Mr. John Sainsbury, of the Bower Roller Bearing Company, Detroit, was the lucky prizewinner. The prize was a bow compass.

This Month's Cover

(Continued from page 24)

ture, however, is identical with that of the one on the other machine.

The cost for labor and tools is considerably less with this method than by methods previously employed, and the total cost, including interest on the investment, power, maintenance, and similar items is also a great deal less.



Starrett Dial Indicators are made in a complete range of standard sizes and dial calibrations or special indicators can be developed to fit your particular problems. Jeweled movements, cut and finished gears and pinions and stainless steel parts make them extremely accurate and durable.

The Special Starrett Dial Indicator Catalog T illustrates and describes the entire line. We will gladly send it on request.

THE L. S. STARRETT CO.
World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy

Athol, Mass., U. S. A.

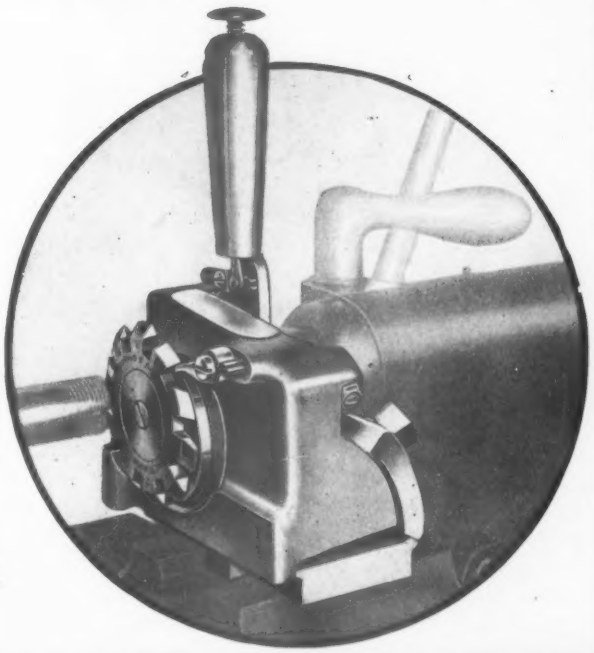
Starrett Dial Indicators

RIVETT IMPROVED THREAD TOOL

Mounts on any screw cutting engine lathe. An unskilled operator can use it. For any diameter or form (except square) of six pitch or finer.

THE THREAD TOOL is a holder for a ten tooth cutter with means for indexing the cutter to present each of the ten teeth successively to the work, and with adjustments for controlling the size of the finished thread.

THE CUTTER is a disc of the best tool steel with ten teeth, each tooth having a prescribed increase in radial length over the preceding tooth, thus comprising, in effect, ten cutting tools. The first nine teeth rough out the thread progressively in nine heavy measured cuts, and the tenth tooth finishes the thread. The responsibility of the operator is reduced to indexing the cutter and reversing the lathe. The thread tool does the rest.



Bulletin 110-A

RIVETT LATHE & GRINDER, INC.

BRIGHTON, BOSTON, MASS.

SWEDISH INTERNAL INDICATORS CHECK BORES FROM ⅜" TO 10" DIA. TO A DEPTH OF 24"

Fast and Accurate
Ideal for precision boring, internal grinding and honing machines.

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Manufacturers of

Multiple Drill Heads

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Special High Production Machinery

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W. F. & JOHN BARNES CO.

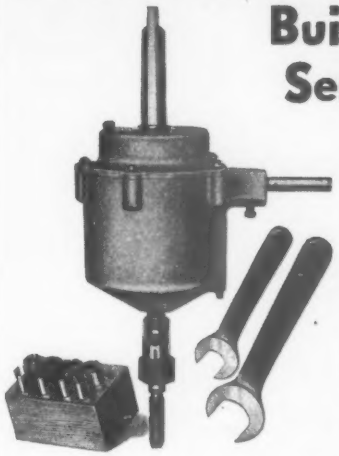
Rockford, Illinois

TAPPING ATTACHMENTS

Built For Service

WITH THE

NEW "TRU-GRIP" TAP HOLDER



The most sensible tap holder that ever gripped a tap.

Superior design, the finest materials, and expert workmanship combine to offer you tapping heads which will give the best service and satisfaction. The new "Tru-Grip" tap holder will make your taps last longer.

WRITE FOR BULLETIN 436

Procunier Safety Chuck Co.

"Pioneers of Safety Tapping"
12-18 So. Clinton **CHICAGO, ILL.**

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GRINDS CARVES POLISHES ENGRAVES DRILLS SAWS

$18.50 Postpaid & Accessories Free

• Unmatched performance — a sensation wherever used, in experimental laboratory, model and tool room, on the production line in large and small plants—making, shaping, polishing all metal products, alloys, glass, composition materials, wood, stone, etc.

Use this amazing tool for difficult precision jobs and hard-to-get-at places on intricate machine parts without removing the parts or dismantling machine. 200 different accessories available.

Fastest and most powerful tool for its type and weight ever developed. 25,000 r.p.m. Weight 12 ounces. Almost human in its smooth, rapid response. Try a Handee! Test for yourself its marvelous efficiency.

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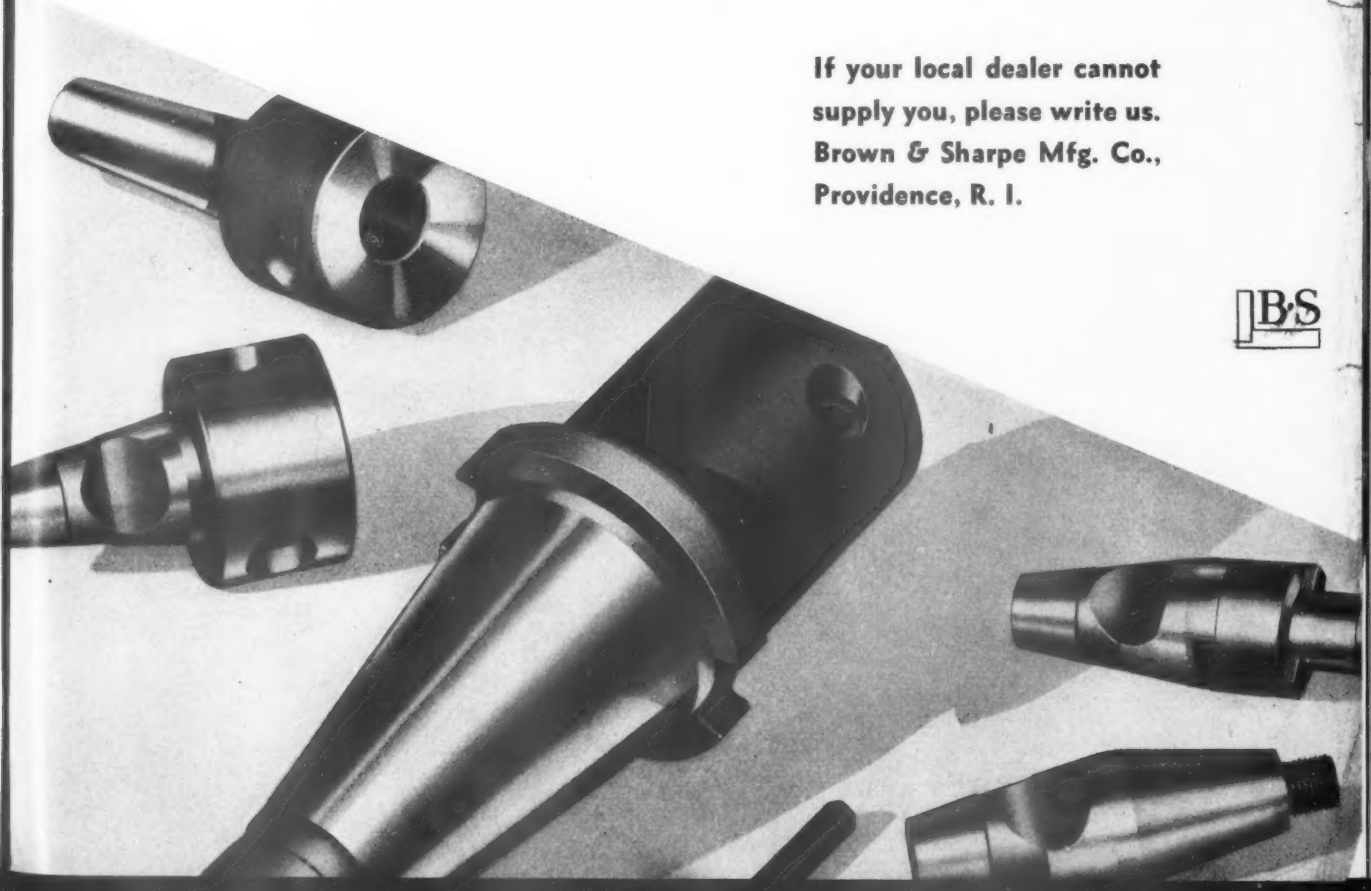
Advertisers' Index

CUT CUTTING COSTS—with BROWN & SHARPE "CAM LOCK" ADAPTERS

—Positive Drive
—Quick Easy Cutter Change

Brown & Sharpe Cam Lock Adapters provide positive, accurate cutter drive—and eliminate the delay in changing cutters, with attendant loss of expensive man and machine time—characteristic of older equipment. You owe it to your business to have this modern time saving equipment in use in your shop.



If your local dealer cannot supply you, please write us. Brown & Sharpe Mfg. Co., Providence, R. I.

B&S

Ex-Cell-O Equipment for Multiple Operations

The economies of grouping a number of operations on one machine in a single set-up are no longer limited to jobs which are big enough in themselves to pay for a special machine.

Ex-Cell-O Hydraulic Power Units in combination with Ex-Cell-O standardized machine tool units including bases, multiple heads, vertical columns, etc. enable you to obtain a special machine at minimum cost. Often, only the fixtures need to be built for the specific job.

Such assembled machines are readily adapted to model changes; the standardized parts may be reassembled into an unlimited number of combinations for future use.

Complete information will be furnished gladly upon request.

XLO

TRADE MARK

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